Issue #294

OUR 25th ANNIVERSARY YEAR!

March 1985
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73 for Radio Amateurs®

A CWC/P Publication

International Edition

Special Report: Volunteer Examiners

HAM-DAY '85— Are You Ready?

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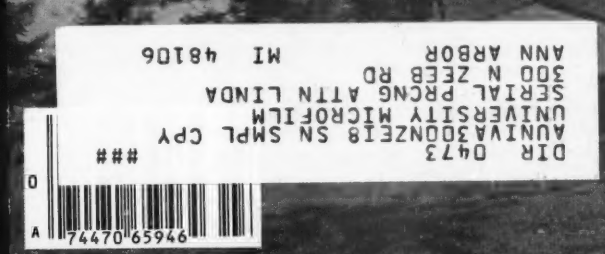

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SSB (PBT) XTAL	FL-30	9011.5	2.3
FM Filter	SMFSA	9011.5	15 (-30dB)
SSB Narrow (Upgrade Option)	FL-44A	455	2.4
OPTIONAL FILTERS			
CW Narrow	FL-52A	455	0.500
CW Narrow	FL-53A	455	0.250
SSB Wide	FL-30	9011.5	2.8
CW Narrow	FL-32	9010.6	0.500
CW Narrow	FL-63	9010.6	0.250
AM	FL-33	9010.0	6.0

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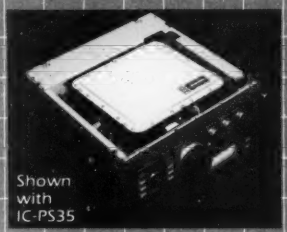
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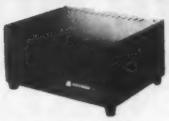

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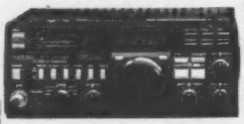

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On the Cover: The 10½' Continental CX-105 at the Pittock Mansion, Portland, Oregon. Photo courtesy of Continental Satellite Systems, Clackamus, Oregon.

73 for Radio Amateurs®

ISSUE #294 MARCH 1985

W. Sanger Green, our "Ancient Aviator" columnist in the 1970s, died Christmas Eve, 1984. We dedicate this TVRO issue to him. Satellites, Shuttle-types, other opportunities high above: I can't say for sure that Sanger ever thought about them when flying, when flying was risky in itself. I suspect he did.—JCB.

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Would you like a fully-programmable Morse keyboard that will balance your checkbook and play Sousa marches? Then read on! W4FXI

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48 Cheap Heath Help
Is your HW-101's offset off? Try this four-dollar fix. Without it, you're being cheated out of QSOs. K6YB

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W2NSD/1

NEVER SAY DIE

editorial by Wayne Green

D-DAY

The recent demand by the ARRL Board that the General Manager increase the number of hams this year was indeed entertaining.

The fact is that amateur radio has gotten to be one of the better kept secrets in our country. Recent surveys have shown that those few people who think they've heard of amateur radio are confusing it with CB. It makes an old-time ham proud, right?

Okay, if we're going to get recruits into amateur radio, our first step is to help make the general public aware of what our hobby is—what, if anything, we're doing. There isn't any way we're going to get new hams if people don't even know our hobby exists.

There have been occasional demonstrations of ham stations at fairs and malls, but those I've seen are long on hams sitting there doing incomprehensible things and short on involving the public in even the slightest way. Oh, we may offer to take and deliver a message for passing people, but when the message is delivered weeks later in garbled form, some of the impact of this approach is lost.

Ham exhibits tend to put emphasis on newer technology too—another confusing situation. How many of the general public will have even the faintest idea of what is going on as a ham RTTY printer clunks away, churning out paper or printer artwork? Phooey.

So let's get cracking on something more practical—a real live demonstration of amateur radio. And let's set this up for Sunday, March 24th, so we can all get involved at once. You could pass the word to some DX stations, asking them to be sure to be around on the 24th to help impress visitors to ham shacks all around our country.

Your job is to make sure that you get any friends or neighbors over on the 24th so you can demonstrate amateur radio to them. This may be on a DX band or over a repeater—either way you will have to explain what you are doing (hopefully in plain language) and then let them get on the air and talk with hams and other similar vis-

Continued on page 55

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, 80 Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

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- EB-2 external C manganese/alkaline battery case
- SC-8 soft case for TH-21A/41A
- SC-8T soft case for TH-21AT/41AT
- TU-6 programmable sub-tone unit
- AJ-3 thread-loc to BNC female adapter

More information available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, CA 90220.

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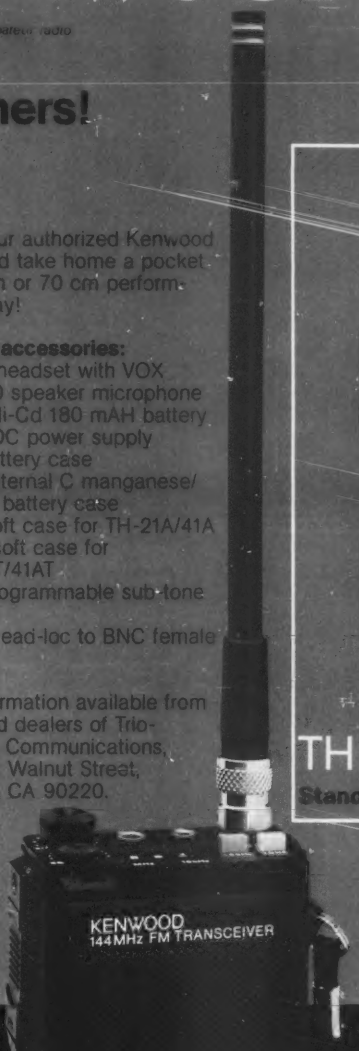
Standard versions.



TH-21AT/41AT Specifications and prices are subject to change without notice or obligation.

KENWOOD

TR-9130

TW-4000A

QRX. . .

EDITED BY PERRY DONHAM KW1O

Ham-Day '85

MARK MARCH 24th on your calendar. That's H-Day, the day that every amateur in the United States will invite one person into his shack to demonstrate what ham radio is all about. Don't worry about shampooing the carpets or serving a five-course dinner, just ask someone over and make a few contacts. Whip out your hand-held and make a telephone call on the local autopatch. Chat across town or across the world, but be sure that *somebody* is there to watch and take part. ARS W2NSD/1 will be on the air from 1500 to 2100 UTC; look for us around 14.255 MHz or drop us a line and we can make a schedule for a contact. Use any mode and band you feel comfortable with, but please *don't let your hobby down.* Remember: March 24th. Pass it on.

Display Replay

KENWOOD TR-2500 OWNERS: Has your LCD turned a nice shade of black? If it has, Kenwood will mail you a free replacement display. Call the company at (213)-639-9000 and ask for Amateur Parts Supply.

Super Fly!

GOING TO DAYTON this year for the big Hamvention? **Fred Maia W5YI** reports that Piedmont Airlines is offering a 35% discount to hams flying to Dayton on Piedmont. The offer is good for a ten-day period centered on April 27, 1985, and is 35% off the normal coach rate—about as cheap as you can go without needing a parachute. To make a reservation, call (800)-334-8644 and ask Ellie Goforth for the **W5YI Hamvention Special.** Fred says that a lot of the credit for this great deal should go to **Maurice Booth WD4RGU,** who is the Customer Service Manager for Piedmont in Dallas. See you at the show!

GLB Update

PACKETEERS USING GLB TNCs, in particular those using them as digipeaters, should contact GLB for an update of their software. PK-1 software prior to version 3.5 will not digipeat multiple frames with multiple digipeaters; if a PK-1 is specified as part of a multi-repeater link, *only the first frame* in any transmission will be repeated. To get the update, send your PROMs or a $10 deposit to GLB Electronics, 1952 Clinton Street, Buffalo NY 14206. The $10 deposit will be refunded when you return your old PROMs.

Elmer Cited

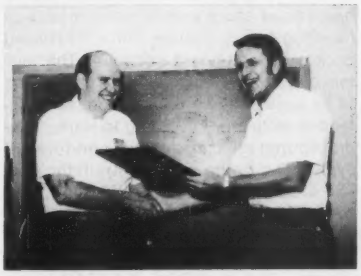
TEACHING KIDS about ham radio has earned **Peter Kemp KA1KD** an award from the Connecticut Department of Education. Cited by the Commissioner of Education as "...an outstanding vocational practice, one worthy of emulation by other schools," Pete's course is taught during the school day and offers students the opportunity to learn the fundamentals of electronic communication, culminating in (you guessed it!) a Novice-class license. Pete says that he has Elmered hundreds of new Novices through the course, and that the state is evaluating the program for possible inclusion in the curriculum of every school in the state!

Hiss and Pop

FOR THOSE STALWARTS who still monitor the ten-meter band for signs of life, I have a very nice list of ten-meter beacon stations, compiled by **Joe Gumino K2OLG,** that can be yours for the price of an SASE. The list seems to be pretty complete, with about sixty stations spanning the range of 28.175 to 28.992 MHz. If you would like a copy, drop an SASE in the mail to *73 Magazine,* 80 Pine Street, Peterborough NH 03458, Attn: 10m Beacon.

DXtra Special

"QRX" CONGRATULATIONS go out to **Don McDaniel KJ3Q,** the 1984 Outstanding DXer, as determined by the Western Pennsylvania DX Association. Don is an active member of the club and appears regularly on the 145.37-MHz repeater operated by the Association. The repeater is used exclusively for DX spotting and contest announcements, and anyone within its three-state coverage area (PA, OH, and WV) is welcome to join in.



An ecstatic Wayne Albert KB3KV (right) presents the WPDXA Outstanding DXer Award to Don McDaniel KJ3Q.

Peter Kemp KA1KD (right) receives the 1984 VIP Merit Award from Connecticut Commissioner of Education Dr. Gerald Tirozzi.

What's New?

SHAMELESSLY STOLEN from *The Ground Wave,* newsletter of the **St. Paul Radio Club,** are a few items to round out every ham's shack:

•For those who keep blowing fuses, 30-Amp fuses marked "3 Amps."

•Antenna tower holes, in assorted sizes and depths. Why dig when you can buy a hole ready-made? The design has been improved by threading them—if you move, simply unscrew them and take them along!

•Antenna grease. One application is all that is needed—standing waves are lucky if they hang on lying down!

•Everett Dirksen lozenges. A fine product that makes SSB sound like AM. These lozenges provide a golden voice, as compared with the silver voice of the William Jennings Bryan lozenges sold by competitors.

Supplies are limited, so be sure to send your blank check today!

Big Picture

THE V/UHF ADVISORY COMMITTEE of the ARRL is soliciting comments on a proposed 13-cm band plan. The VUAC is trying to formulate a plan that will accommodate all of the current users of the band, as well as allow for future modes and techniques that may be developed. In addition, the VUAC is investigating the exchanges and procedures used in EME and

"Now here's an exclusive new feature..."

meteor-scatter communications, with an eye toward a standard system. Everyone's ideas are important, and you can contact the VUAC by writing Mark Wilson AA2Z, ARRL Headquarters, 225 Main St., Newington CT 06111.

Space Aces

NASA SAYS "OK" to the planned ham-in-space flight of **Dr. Tony England W0ORE** and **John-David Bartoe W4NYZ** coming up on April 17th. It sounds as if the astronauts are packing their entire shack for the trip—in addition to the 2-meter rig used by Dr. Owen Garriott W5LFL, Tony and John-David will be carrying HF and SSTV equipment on board. The entire setup will be very flexible, allowing SSTV on ten and two meters, a two-meter to ten-meter repeater (similar to the OSCAR and RS transponders), and of course the 2-meter mode used on the W5LFL mission. The antenna to be used is an unusual design—a form of matching device will be used to excite the entire payload bay. Interestingly, both hams must apply for an FCC waiver for the mission, as only Extra-class licensees are eligible for space operation (both astronauts hold General-class tickets). Watch "QRX" for late-breaking ham-in-space news.

Fuzz Busters!

REMEMBER D&D, Inc., of Shelby, North Carolina? They were raided by Federal Marshals last year and faced fines of up to $10,000 for distributing illegal CB equipment. The raid netted nearly $140,000 worth of gear. Well, the Feds have really outdone themselves with their latest venture! Engineers from the FCC New York District Office and Special Agents from US Customs raided **Granada Electronics** in Brooklyn, seizing over 2700 pieces of gear with an estimated value of *one-half million dollars*! The rigs included CB transceivers capable of operating on unauthorized frequencies and of using excessive transmitter power. The items were manufactured in the Far East and were allegedly imported into the US for illegal sale. In another action, Customs agents arrested **Lawrence Wallach** of LW Sales, Lynbrook, New York, for allegedly selling non-type-accepted CB transceivers which were illegally brought into the US. LW and Granada were the subject of a two-year Commission investigation into the importation and marketing of illegal equipment.

Hands Off

THE NEXT STEP toward an automatic message-delivery system has been made here in New England. **Hank Oredson W0RLI** has added store-and-forward message handling to his popular Xerox 820-based packet bulletin-board software. The system allows a message left on one mailbox to be passed along until it reaches its intended recipient. According to Hank, "The distributed-message store-and-forward system is growing very rapidly. In the Boston area, K1BC, W0RLI, WB2OSZ, and KA1T are all using auto-forwarding. In Arizona, K7PYK is available, linked to W0RLI via HF. Other EASTNET mailboxes now on the air...include W3IWI and KS3Q in the Washington DC area, WB2MNF in New Jersey, and W1AW-4 in Newington. At least nine other stations should be coming up in the future. The network, both real-time and store-and-forward, is growing fast." If you are working on a similar system, Hank would like you to get in touch with him at his *Callbook* address. Hank will also provide copies of MailBox—just mail him an 8" disk with return postage.

Voice From Above

LISTENING FOR THE SHUTTLE? The Goddard Amateur Radio Club at the NASA Goddard Space Flight Center in Greenbelt, Maryland, retransmits live audio from the Space Shuttle on nearly all STS missions. **Pat Kilroy WD8LAQ** explains that club station WA3NAN transmits on 3860, 7185, and 14295 kHz, starting about one hour before lift-off and ending about one hour after the Shuttle lands. Off times coincide with the astronauts' sleep periods.

Hello, Mr. Chip

MOTOROLA has finally released a long-awaited member of its M68000 microprocessor family. The original MC68000, found in several micros currently on the market, uses 32-bit internal data representation but has only 16-bit-wide external buses. Motorola's new MC68020 fills the communications gap by providing full 32-bit-wide data streams, both inside and out. Incredibly, the chip can address up to *4 gigabytes* of memory and runs around 3 million instructions per second (MIPs). What's *really* impressive is that all of this power has been condensed onto a die that's roughly 350 mils square! The processor is object-code-compatible with the rest of the 68000 family. What can you do with such a chip? All sorts of ham applications spring to mind. How about voice-recognizing repeaters? Or automatic phone-contesting stations? The price is reasonable—487 bucks—so be sure to buy a few extra for spares!

Oracle

COMING UP IN 73: In April you can take a sneak preview of the Dayton Hamvention, the radio amateur's Mecca. And May brings our annual spring antenna issue, packed with aerials of every shape and size, just in time for that antenna work you've been planning all winter. Of course, every issue is full of the kinds of things you've grown to appreciate in *73*, and we'll be bringing in a few surprises during our 25th anniversary year just to keep you on your toes.

Kudos

SO MANY PEOPLE help make "QRX" happen each month, and it's always a pleasure to thank them. This month, help came from the *W5YI Report*, *Westlink*, *Gateway*, and numerous other hams who support this column with their cards and letters.

ICOM VHF Transceiver

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Optional Features. AG-25 switchable preamp, UT-15S CTCSS encoder/decoder (encoder is standard), IC-EX310 voice synthesizer, IC-SM8 two-cable desk mic and IC-SM6 desk mic. PLUS a variety of power supplies... IC-PS30 system power supply, IC-PS15 external or IC-PS35 internal power supplies.

The IC-271A. The 25 watt IC-271A has the same outstanding featues as the IC-271H, including an internal power supply, IC-PS25.

IC-271H Shown with internal power supply, IC-PS35.

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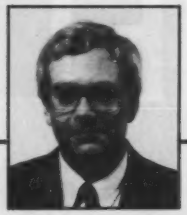

WHAT?

News from the Publisher

Well, whether you call it H-Day or ham D-Day, Sunday, March 24, is shaping up to be quite a time for all hams. As you know, that's the day we're asking YOU PERSONALLY to do your small part to help ensure a strong and vibrant future for amateur radio.

The means, of course, is simple: You invite someone—anyone—into the shack for one hour to watch you operate and to catch the excitement. We're not talking about anything fancy or out of the ordinary on your part as far as preparations go. All it takes is something like, "Say, Chris, the 24th is National Ham-Day, when we invite people into our ham shacks to show them a little about ham radio. Thousands of people all over the country are going to be doing this and I wondered if you'd like to come over and be MY guest for a few minutes. I'd love to have you listen in on the action." That's all there is to it. And if Chris can't make it, try someone else.

By the way, while H-Day is a *73* idea, it's not a *73* project. It's YOUR project. So it doesn't matter whether you're pro-Wayne or anti-Wayne, pro-League or anti-League, pro-*73* or anti-*73*. What matters is that you're PRO-AMATEUR RADIO. Let us and the other publications know how you make out, OK?

On another subject, we'd like to give a special mention to some of the fine, fine people we met or got reacquainted with during our recent trip to the Seattle area. The main event was the opening of ICOM's new headquarters and I'd like to tell you that the only thing we found classier than the opening ceremonies and reception and the building itself was the people who make things work at ICOM. So thanks, Bob Brunkow and Evelyn Garrison, and we'll end it right there. Too many people were too nice to us for me to even dare risking leaving someone out.

Our thanks, too, to Mike Lamb and George Buxton of AEA, Bill Nye of the William Nye Company, and Dale Osterud of C-Comm. They took time out from busy schedules to show us their facilities, show us the town, and show us that they're as dedicated to ham radio as you are. We do apologize to one person, though, whom we didn't have the chance to get together with: Bill Gosney KE7C, *73*'s great Awards and Contest Coordinator. Sorry, Bill—next time for sure.

Other news notes:

- If you're ever in the Bellevue WA area, stay at the Red Lion. It's not a world-class place—yet—but it's nice. One reason I think it's better than most, aside from the usual restaurants, atrium, and interior exterior elevators, is that I saw someone polishing a bench when it didn't need it. I couldn't believe it—I thought maybe it was showtime, guests—so I did your basic thirty-second sneak-around peek-around. This time, he was on his hands and knees cleaning the bottom side of a coffee-table top. Three stars, Red Lion/Bellevue, for having great people throughout; this guy, whoever he was, was not alone.
- Who cares about Prem Krishna Gongaju? He claims to be the best editor/typesetter in the world. He's wrong, but we're lucky to have him anyway. He'll find some way to screw up this paragraph and say that we're prejudiced about Nepalese, but who cares?
- Congratulations to Steve Jewett on his promotion from Assistant Managing Editor to Managing Editor. He worked his way up from the ranks, which is about the highest compliment I can give. He also will probably try to sandbag this page in some way—just to show who's boss.
- Keep up the great work with all those cards and letters. We really appreciate your comments and suggestions, and we count on your ideas to help us continue to make *73* better than it has ever been before. *73* isn't ours—it's yours. Tell us what you'd like to see.
- Remember, the call is "CQ Ham-Day." Give it your best shot for one hour on one day and, again, let us know how you do!

Jack Burnett

Four presidents (left to right): Tokuzo Inoue JA3FA (ICOM), Dale Osterud W7GAB (C-Comm), Bill Nye W7DZ (Nye Co.), Mike Lamb N7ML (AEA).

MPA

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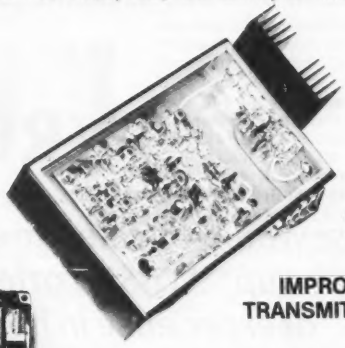

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- **Rcvr. Bd. mounted in shielded housing.**
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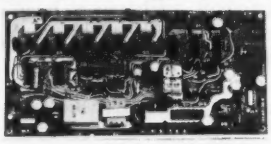

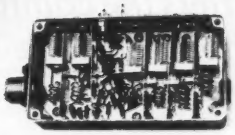

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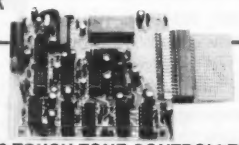

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Robert J. Buckman W6SMJ
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TVRO Trivia

To those would-be satellite enthusiasts wondering which way is "up," W6SMJ offers the comfort of his years of experience in home satellite TV reception.

I have been following the developments in Television-Receive-Only (TVRO) satellite systems since 1975. Five years ago, a few hardy souls were home-brewing systems and developing hardware to make it possible for a hobbyist to afford a TVRO system. Now even your local department store will sell you a system for $3,000—less than a good used car. How low can the price go? How good are the kits? How tricky is installation? How critical are antenna adjustments? How good is the picture? I'll try to answer these questions and describe for you my experiences in building a system.

I see TVRO systems as the shortwave-listening hobby of the eighties. The frequencies involved (4,000 megahertz) and the reception distances (23,000 miles plus) are greater than shortwave conditions, but the basic attractions of the hobbies are quite similar: the desire to log a new country (transponder), the sense of wonder over the reception of a signal from a distant point ("this is NBC London"), and the constant fight over improving hardware (is a 27-MHz i-f bandwidth better than 35 MHz?).

TVRO systems have three basic components: a directional antenna, a low-noise amplifier (LNA), and a receiver. Cables interconnect the three major components and usually some additional electronics is necessary to make sound and picture appear on your TV. Let's look at what's available in those three major categories.

Antennas

Antennas can be divided into two categories: parabolic and spherical. The advantages of a spherical are that once installed the reflective surface does not have to be moved (the feed is moved to select different satellites), and multiple satellites can be received with multiple feeds. Spherical surfaces are also easier to construct.

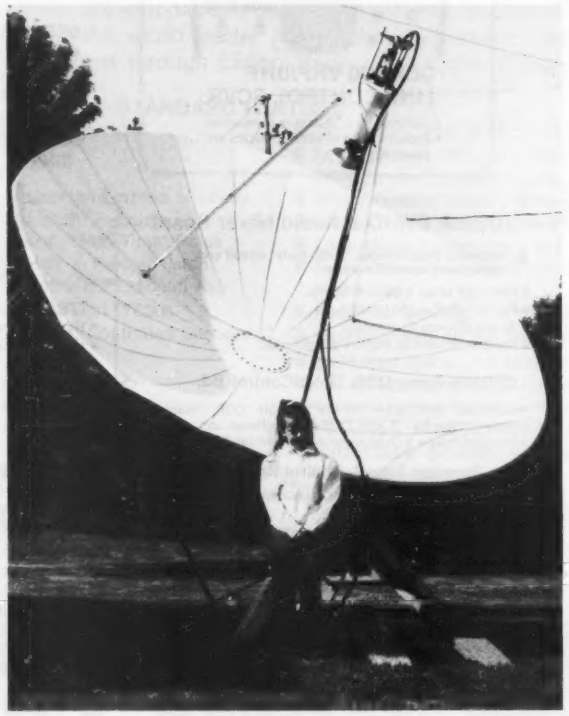

Photo A. The ADM-11 dish—my niece Dawn is about four feet tall.

Parabolic antennas must be moved to focus on other satellites, are harder to build precisely, and can be used for only one satellite at a time. The parabolic antenna usually takes less real estate to install since the feed is usually contained within the antenna volume, while the spherical feed is usually twenty to thirty feet in front of the spherical surface. I will discuss only the parabolic antenna systems.

There are two general types of mounts for parabolic antennas: the azimuth and elevation (az-el) mount which requires rotation in two axes, and the polar mount which lets you rotate the dish in the plane of the satellites. Several computer programs have been published to allow you to calculate az-el angles based on your latitude and longitude and the satellite longitude (satellite latitude is zero

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FM (limiting) mode gives easy, trouble-free operation. Best for general use, off-shift copy, drifting signals, and moderate signal and QRM levels.

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Built-in RS-232 interface, no extra cost.

Variable shift tuning lets you copy any shift between 100 and 1000 Hz and any speed (5-100 WPM RTTY/CW and up to 300 baud ASCII). Push button for 170 Hz shift.

Sharp multi-pole mark and space filters give true mark-space detection. Ganged pots give space passband tuning with constant bandwidth. Factory adjusted trim pots for optimum filter performance.

Multi-pole active filters are used for pre-limiter, mark, space and post detection filtering. Has automatic threshold correction. This advanced design gives good copy under QRM, weak signals and selective fading.

Has front panel sensitivity control.

Normal/Reverse switch eliminates retuning while checking for inverted RTTY. Speaker jack. +250 VDC loop output.

Exar 2206 sine wave generator gives phase continuous AFSK tones. Standard 2125 Hz mark and 2295/2975 Hz space. Microphone lines: AFSK out, AFSK ground, PTT out and PTT ground.

FSK keying for transceivers with FSK input.

Has sharp 800 Hz CW filter, plus and minus CW keying and external CW key jack.

Kantronics software compatible socket.

Exclusive TTL/RS-232 general purpose socket allows interfacing to nearly any personal computer with most appropriate software. Available TTL/RS-232 lines: RTTY demod out, CW demod out (TTL only), CW-ID in, RTTY in, PTT in, key in. All signal lines are buffered and can be inverted using an internal DIP switch.

Metal cabinet. Brushed aluminum front. 12½x2½x6 inches. 18 VDC or 110 VAC with optional AC adapter, MFJ-1312, $9.95.

Plugs between rig and C-64, VIC-20, Apple, TRS-80C, Atari, TI-99 and other personal computers. Use MFJ, Kantronics, AEA and other RTTY/ASCII/AMTOR/CW software.

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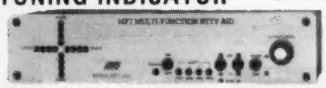

Greatly improve your RTTY copying capabilities. Add a crosshair LED Tuning Indicator that makes tuning quick, easy with pin-point accuracy. **Add** mark and space outputs for scope tuning. **Add** LEDs that indicate 170, 425, 850 Hz shifts. Great for copying RTTY outside ham bands. **Add** sharp mark and space filters to improve copy under crowded/weak conditions. 170, 425, 850 Hz shifts. **Add** Normal/Reverse switch to check for inverted RTTY without retuning. **Add** output level control to adjust signal into your terminal unit. **Add** a limiter to even out signal variation for smoother copy.

Unit plugs between your tuner and receiver. Mark is 2125 Hz, space is 2295, 2550 or 2975 Hz. Measures 10x2x6 in. and uses floating 18 VDC or 110 VAC with AC adapter, MFJ-1312, $9.95.

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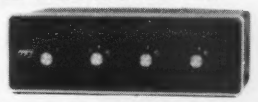

MFJ-407 Deluxe Electronic Keyer sends Iambic, automatic, semi-auto or manual. Use squeeze, single lever or straight key. Plus/minus keying. 8 to 50 WPM. Speed, weight, tone, volume controls. On/Off, Tune, Semi-auto switches. Speaker. RF proof. 7x2x6 inches. Uses 9 V battery, 6-9 VDC or 110 VAC with AC adapter, MFJ-1305, $9.95.

MICROPHONE EQUALIZER

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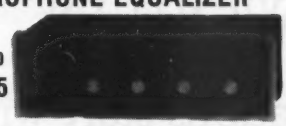

Greatly improves transmitted SSB speech for maximum talk power. Evens out speech peaks and valleys due to voice, microphone and room characteristics that make speech hard to understand. Produces cleaner, more intelligible speech on receiving end. Improves mobile operation by reducing bassy peaks due to acoustic resonances. Plugs between mic and rig. 4 pin mic jack, shielded output cable. High, mid, low controls provide ±12 db boost or cut at 490, 1170, 2800 Hz. Mic gain, on/off/bypass switch. "On" LED. 7x2x6 inches. 9 V battery, 12 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

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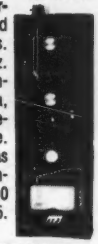

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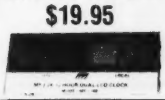

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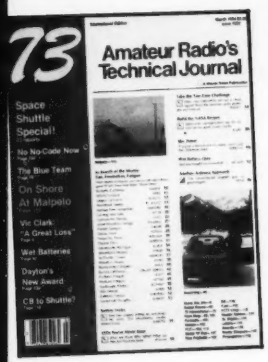

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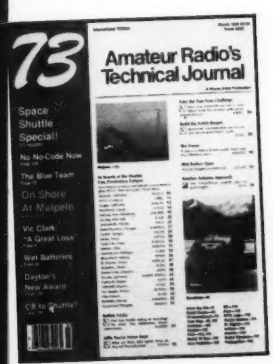

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degrees for geosynchronous satellites). For my installation, a polar mount, az-el angles are uninteresting; the important angle for a polar mount is the polar angle or inclination angle.

A crude estimate of the polar angle is ninety degrees minus your latitude. A better estimate is to take the elevation angle from an az-el chart calculated for your site for the satellite closest to your longitude. (That's the satellite closest to due south of your site.) Expect to rotate the mount up or down a few degrees from that initial polar angle.

Think about your antenna location before committing yourself. Stand on the site and mentally point your antenna south at the initial polar angle while looking for obstructions. All satellites east and west of your location will fall along an arc in the plane of the polar angle. In my case, a neighbor's tree slightly east of my preferred location will grow eventually to block satellites from 75 to 85 degrees west longitude. Since I usually move every three to six years in my profession, I installed the antenna there anyway.

After shopping for years (and even attempting to build—but that's another article), I eventually purchased an ADM-11 parabolic antenna kit with a polar mount at the Dayton Hamvention from an exhibitor who didn't want to disassemble it and haul it home. I got a good price and, when torn down, the dish fit easily into a station wagon (room for two!).

The ADM-11 is an eleven-foot-diameter parabola built from twenty-four pie-shaped segments of 0.090 aluminum bolted together with five-sixteenths-inch hardware and stiffened with aluminum angle braces to support the shape. Assembly of the segments determines the final antenna gain and sidelobe performance.

The main problem with segmented kit parabolas is maintaining the parabolic curve across segment boundaries. No matter how I torque the bolts along the boundary, there is still a gap which will not close completely. How that gap appears to affect performance will be disclosed later.

Of primary importance when installing the polar mount is establishing a true north-south line through the "pole" of the polar mount and a level rotation plane. I'll tell you why that's important later. For my north-south alignment, I sighted the North Star through the polar tube and used a carpenter's level and an auto jack to level the legs of my mount. I had to wedge some plywood under one leg to hold the mount level.

After the dish shape was finished and the steel tripod polar mount assembled in place, I needed three husky folks to help me lift the 200-pound dish onto the "pole" of the polar mount. With the help of three teen-agers from the Explorer post I advise, the dish was placed on the mount in under sixty seconds.

There are at least four variables in parabolic antenna alignment: azimuth and elevation angles, focus depth (the distance from the feedpoint to the center of the dish), and waveguide polarization. Normally, some kind of signal can be received regardless of initial polarization, but you should start with the wide opening of the

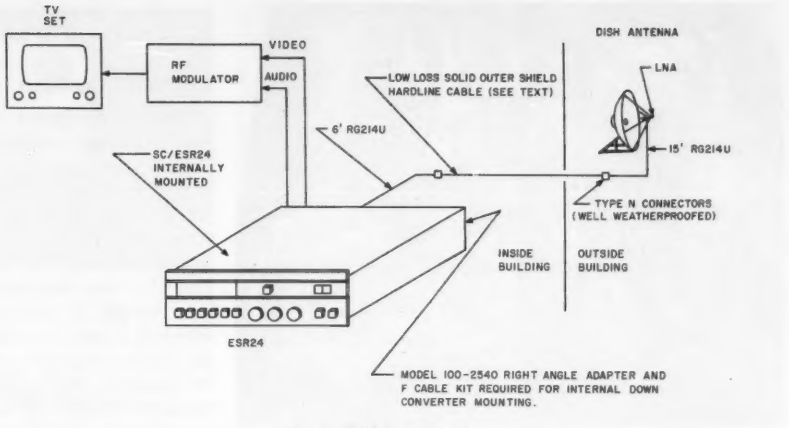

Fig. 1. TVRO system.

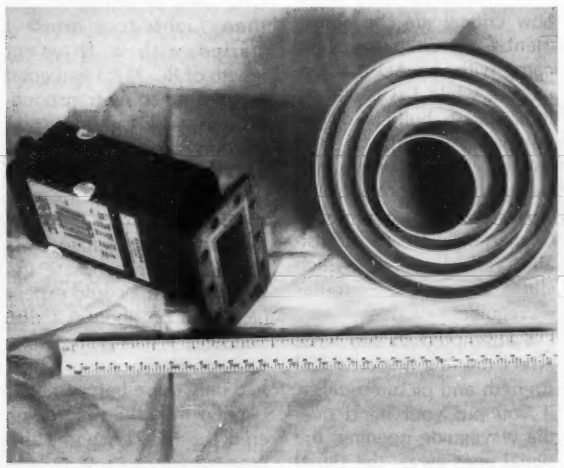

Photo B. An Avantek LNA and the Chaparral feed.

Photo C. The Sat-Tec R2B receiver.

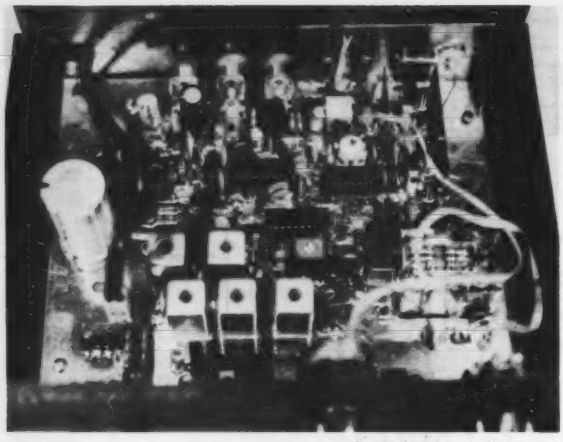

Photo D. All on one board except the first mixer and local oscillator.

waveguide parallel to the horizon. Once a signal is found, rotating the polarization for best signal will eliminate that variable. Even the best dishes will allow a signal of some kind within a half inch or so of the manufacturer's specified focal point. In my dish, focus distance could be moved two to three inches with little effect on the picture or signal strength. This effect is the primary result of the dish segmentation; the focus point is blurred (just like a curved mirror distorts your reflection). The remaining variables then, azimuth and elevation, are the only adjustments left. Before we can adjust those, the rest of the system must be working.

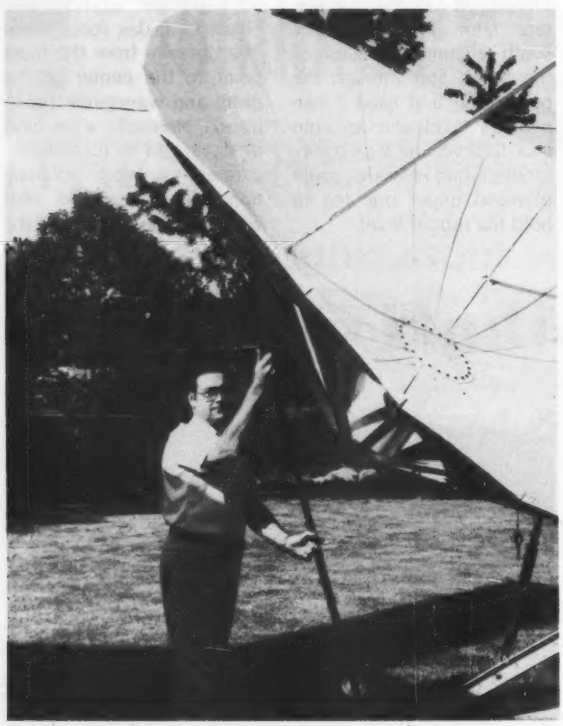

Photo E. To change satellite, just slide the telescoping tube a few inches and tighten the wing nut.

Low-Noise Amplifiers

Next the feedpoint. Whatever reflective surface you choose, the microwave energy is focused to (hopefully) one point, the focus point, where you must place the actual antenna. In all the cases I've seen, that antenna is a section of waveguide which is bolted to a matching cavity moulded as part of the LNA. The bolting interface is the WR-229 microwave standard interface.

I suppose you could develop your own antenna cavity, but with the low prices of assembled and tested LNAs today, I chose to buy rather than build. I purchased an Avantek LNA with the 120-degree-Kelvin noise temperature and the nominal fifty-dB gain. Later, I substituted a 100-degree-Kelvin LNA, but observed no significant change in the picture. Unless you are a whiz at 4 GHz or a sucker for punishment, I recommend you buy the three major components from reputable sources—at least until you have an operational system. Then, if you want to experiment with the black art of LNA development, you at least will know where to point the antenna.

There's been a lot of talk about feedhorns: Which is better, how do they work, how critical are the adjustments? A Chaparral feed came with the ADM antenna, but while I was still attempting to build a dish, I purchased an Apollo feed and I did compare the performance. The Apollo is slightly larger than the Chaparral, with an adjustable reflecting ring which slides along the circular waveguide.

I attempted to see what effect the ring has on signal strength and picture quality. If you put your hand over the waveguide opening, the signal goes away; the signal doesn't penetrate flesh. It's important, therefore, to avoid body effects in measuring the differences. I moved the ring from the back of the feed to completely off the feed with no significant change in the picture or signal strength. I did find a small peak in signal strength at one position close to where I had started, and I locked the set screw down there. I'm sure I was affecting the sidelobe performance, but it didn't show in the picture. The Apollo also had more signal strength than the Chaparral on all transponders, but I don't know why. I also tested an old brass horn feed—its performance was lower than either of the other feeds by almost two full units on the Drake's signal-strength meter—no matter where I adjusted the focus depth—with significantly more noise in the picture (I considered that picture unwatchable).

Cable Losses

How do you get the amplified 4-GHz signal to your receiver? If you look at what the booth exhibitors use, you'll find a mixture of hardline, RG-8, RG-214, RG-58, and some unlabelled stuff that looks like it's been through the war. The instructions supplied with most receivers suggest that RG-8, RG-214, and RG-213 have roughly the same losses at 4 GHz and recommend less than eighty-foot runs. I started with a fifty-foot length of RG-213; I had good pictures on some transponders and weak to nonexistent pictures on others. RG-217 has five dB less loss per hundred feet than RG-213, so I ordered fifty feet and then temporarily cut ten feet off the RG-213 to estimate the improvement I could expect (it should be about 1.7 dB). Suddenly I had perfect pictures on transponders which had only noise before!

Then the UPS man delivered the RG-217, and I discovered why so few people use it and vendors don't talk

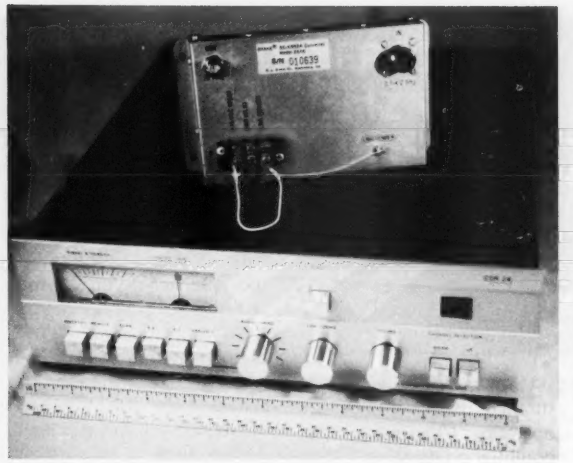

Photo F. The Drake ESR-24 with the downconverter outside the box.

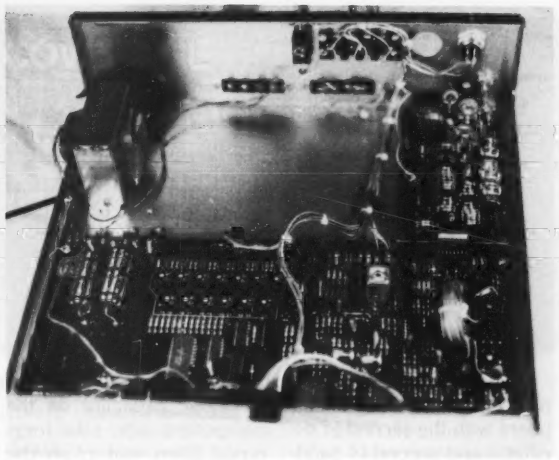

Photo C. The inside of the Drake with space for the downconverter inside.

about the cheap price; the cable is larger diameter than the normal N-type connector; the special-order, oversize N-connectors cost $10.00 each! The stuff is also constructed with a solid center conductor requiring larger-bend radii.

The solution to the 4-GHz cable loss problem is to either use short runs or move the first mixer to the antenna and send lower-frequency signals down to the rest of the receiver. Cable losses are much less at lower frequencies. This approach requires that power and mixer-tuning voltage be run to the antenna. The mixer design must also handle temperature and other environmental extremes. When the mixer and LNA are combined in one package, the device is known as a Low-Noise Converter (or LNC). The disadvantage of this technique is that if the LNA fails, you also have to change the mixer. Since there doesn't seem to be a standard interface for LNC input-tuning voltage, output i-f frequency, or drive capability, the LNCs are not as interchangeable as LNAs are.

Receivers

Let's look inside the house now at receivers. In 1981 I bought a Sat-Tec R2B receiver kit from Ramsey Electronics at the Dayton Hamvention. This receiver has been advertised for several years in full-page color ads. It was showcased in a multi-part article in *Radio-Electronics* in 1982, and the article is a fairly good summary of the assembly instructions. That series of articles is also the only place that a schematic of the first mixer was published. I suppose you could draw a schematic from the assembly instructions which came with the kit, but one was not provided.

The Sat-Tec receiver is a double-conversion, superheterodyne, tuneable, single-transponder receiver with a tuneable audio subcarrier demodulator. Passive diode mixers are used for both i-f conversions, and the Signetics NE564 phase-locked loop (PLL) integrated circuit performs the FM to video and audio conversion in the now-classic style. The second intermediate frequency (i-f) is seventy MHz, and to avoid selecting PLL chips which operate at seventy MHz, an emitter-coupled logic (ECL) flip-flop divides the i-f frequency in half (to 35 MHz) before demodulation. This division requires some tricky biasing of the flip-flop's operating point, but has the bonus of solving the PLL overloading problem; the PLL is now driven by a flip-flop whose output never rises above logic high. Automatic frequency control (afc) is provided to the first i-f oscillator, a Watkins-Johnson monolithic microwave oscillator in a TO-6 case.

The receiver kit is laid out

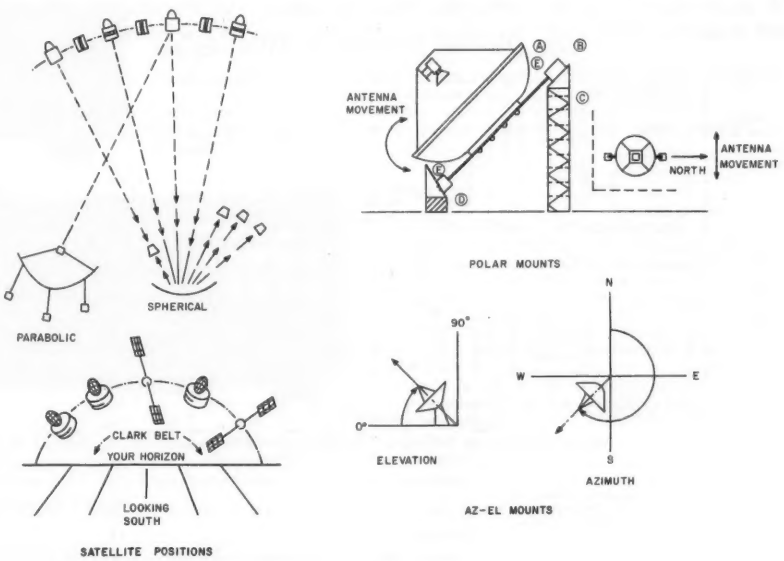

Fig. 2. Parabolic and spherical antennas, polar and az-el mounts.

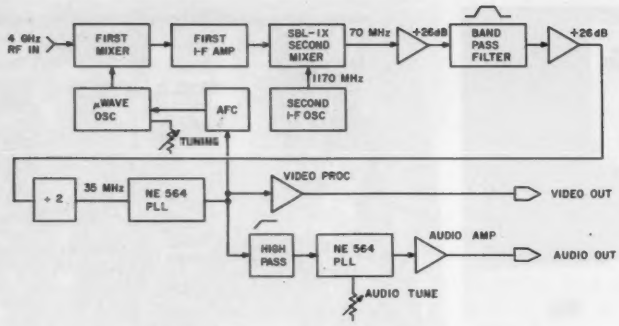

Fig. 3. Sat-Tec receiver block diagram.

on a double-sided circuit board with the second i-f oscillator and second i-f bandpass filter pre-assembled and pre-aligned. The first mixer is constructed as a diode bridge on a separate double-sided circuit board soldered on one edge to the mother board during assembly. The kit instructions are not Heathkit® quality but are sufficient for experienced kit builders. The warning that several capacitors *must* be soldered on both sides of the mother board cannot be stressed too strongly. This board does *not* have plated-through holes; soldering on both sides where indicated is the *only* way to carry ground to several integrated circuits and other parts on the board.

If you're ever in doubt about making a solder joint to a disc capacitor on the component side, take long-nosed pliers and crush the dipped insulation from the ground-lead side *before* inserting the capacitor into the board. Don't be afraid to verify the ground connection with an ohmmeter after soldering.

The pins on the second mixer were much too large to fit the holes provided; I drilled them out with a #55 drill. The rest of the assembly went smoothly, but you have to remember to solder the tin shields in place along all the edges and both sides of the first mixer board to avoid i-f leakage.

The kit receiver-alignment instructions assume a properly aligned and pointed antenna and an operating LNA. Since I had a kit antenna and only the vendor's assurance that the LNA was operating, I had many more potential problems.

In fact, I did have to impose upon another satellite system owner to align my receiver since I did not realize that the noise I saw on my TV set was, in fact, a satellite as I swept the antenna back and forth.

I talked earlier about antenna alignment and selecting the polar angle and then looking for a satellite. The antenna manufacturer recommends using SATCOM 3 for testing since that bird has 24 transponders, most of which have signals all the time. I have to agree that for a receiver like the Sat-Tec (without a scanning capability), it's better to find a satellite with lots of signals so your probability of finding one is higher.

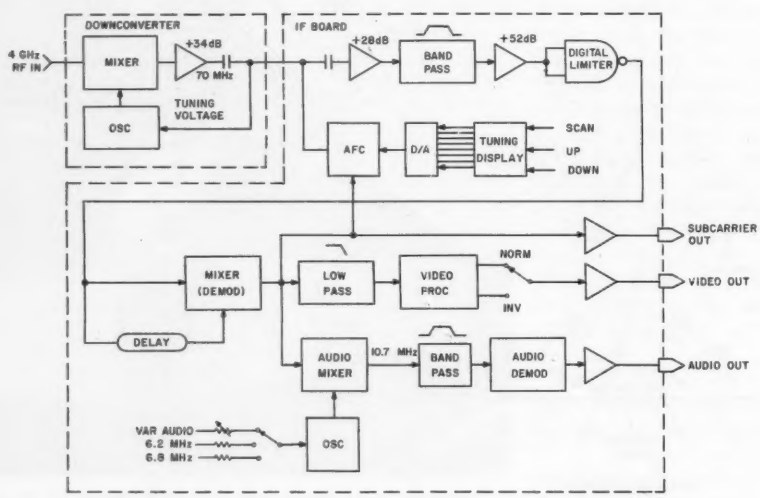

Fig. 4. R. L. Drake ESR-24 receiver block diagram.

The process I use for finding satellites involves lots of antenna movement. First, pick a polar angle. Then, sweep the sky slowly looking for *any* signal, even if it looks like noise. If you find something, lock the antenna down and tune the receiver looking for any kind of picture. Rotate polarization, too. The signal you see may not be television but instead a data transmission or a telephone multiplex carrier. If you see nothing in the sweep of the dish, adjust the elevation (or polar angle) and try again.

Once you have found something, the first i-f stages must be aligned. The tuning on the first i-f is sharp; plus or minus half a turn of the piston capacitors makes all the difference in the world. If you didn't start with the pistons five turns out, you may never see a picture.

Tuning of the PLL is sharp too, and it interacts with the front-panel tuning control and the flip-flop bias adjustment. In my receiver, the audio tuning is also sharp and, when tuned below the 6.2-MHz subcarrier frequency, degrades the picture as well (no, I don't know why).

In the design of the receiver, pains were taken to attempt a linear front-panel control for transponder selection. But the nominal dc voltage to the tuning circuit is +18 volts; my power supply generates about +20 volts dc. When the tuning pot is minimum, set to transponder one, and the dial-set trimmer control is set to transponder one, not enough dial range is available to tune all twenty-four transponders.

The kit instructions say that a dc isolation block (a device to couple power into the coax to supply the LNA) is not required and that a four-inch piece of enameled wire can be connected from the LNA power phono jack to the center pin of the 4-GHz rf input connector. A high enough impedance will

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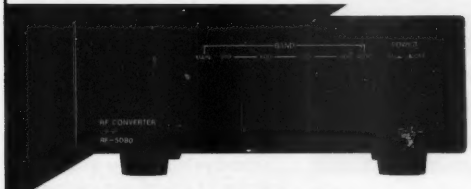

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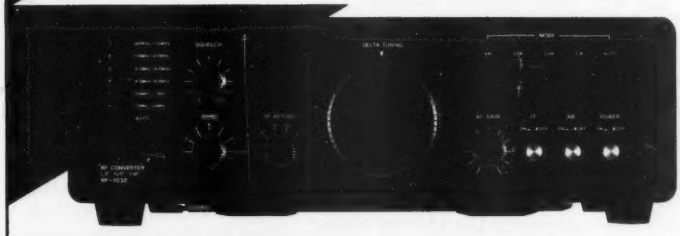

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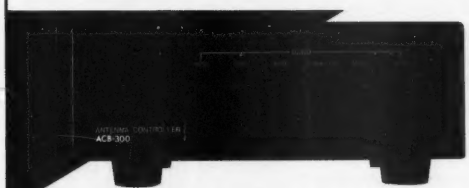

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exist to avoid signal loss. I tested this trick with an external Avantek dc isolation block. It's true: The external block was not needed, but in my receiver the lead dress on the four-inch wire did make a difference in the picture, and by looping one turn of the wire around C71, a ten-microfarad electrolytic capacitor on the first mixer board, the black and white shot noise known as the sparklies went away.

I noticed a similar effect with the tuning control wires, which run from the rear of the circuit board to the front panel. I also found spots along the i-f shields where placing my fingers would reduce the sparklies. That noise was my first clue that I had a receiver problem. When I placed an alligator clip on the edge of the mixer board and all the sparklies went away, I was sure I had a receiver problem.

As time went on, a warm-up period became necessary to get any picture. Finally the receiver died and, during troubleshooting, I discovered that the microwave first i-f oscillator had failed. During the disassembly, I found that no connection was made from the shield side of L10 to the mixer diodes junction. During assembly, I neglected to verify this connection with an ohmmeter because it would have involved applying the ohmmeter current source back into the microwave oscillator, a $100 part. The open shield provided no signal return for the microwave oscillator, and probably caused its failure. I'm impressed it lasted as long as it did.

Since that failure and some half-hearted troubleshooting attempts, I purchased a Drake ESR-24 receiver. The Drake has all the features I could ask for: push-button up or down transponder tuning with digital display, center-tuning and signal-strength meters, a scan mode for rough antenna alignment, fixed and variable audio subcarrier tuning, and even a front-panel audio-volume control. The downconverter is a separate box which can be remotely mounted near the LNA to cut 4-GHz cable losses—recent distributor price cuts have made it affordable. The clean-cut front-panel layout makes the receiver look like a quality piece of stereo equipment. Delivery from Hoosier Electronics took four days (two were the weekend) and it worked when I turned it on.

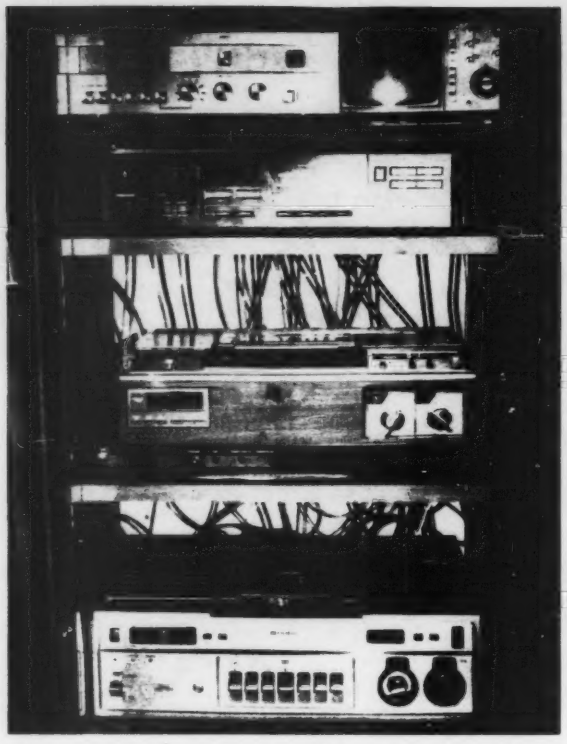

Photo H. The video rack with Drake receiver, Pioneer video tuner, and two Beta video cassette recorders.

Of course I couldn't wait to get the cover off and compare designs with the Sat-Tec. The instruction manual doesn't provide a schematic or even a block diagram, but for $15.00 Drake will sell you a schematic set which includes all the schematics and a more detailed set of alignment instructions.

The Drake receiver is a single-conversion, superheterodyne, tuneable, single-transponder receiver with one pre-selected or tuneable audio subcarrier demodulator. The first mixer, i-f oscillator, and two stages of 70-MHz i-f amplification are mounted in a separate metal box which may be mounted closer to the LNA or inside the receiver case. Negative dc tuning voltage from the receiver is fed back up the i-f coax cable to the first mixer. A separate pair of wires supplies 15 volts dc to power the mixer and LNA.

Inside the main receiver case are two double-sided printed circuit boards; one is the i-f amplifier/filter board and the other board holds everything else but the power transformer and the meters.

The i-f circuit board has two more 14-dB i-f gain stages before the bandpass filter and three more gain stages (all Motorola MWA 120s) after the filter. Signal strength is sampled at the output of the first i-f stage after the bandpass filter. It's first isolated with a transistor and then converted to a dc level by a voltage-doubler diode pair for application to the signal-strength meter.

An i-f gain control is provided between i-f stages one and two, before the bandpass filter, to reduce the signal level if required. In my installation, most domestic transponders will pin the signal-strength meter with that control all the way up.

One last component on the i-f board is a digital integrated circuit, a Schottky quad dual-input NAND gate used as a limiter at the output of the i-f chain. Since the information on the 70-MHz i-f is frequency and not amplitude, the signal is applied to the input of the NAND gate where the alternating-current i-f voltage will change the output of the NAND gate from logic high to logic low as the zero-to-one input threshold is crossed, effectively amplifying the i-f signal yet clipping the signal between logic high and low to eliminate any amplitude components.

The main receiver board contains CMOS digital ICs for transponder selection and digital display. The detector is a simple doubly-balanced mixer which is self-excited by delaying the input signal through a coax delay line. The base band output is low-pass filtered for video processing and for i-f oscillator afc. The base band is also mixed with a voltage-controlled oscillator (vco) to produce a 10.7-MHz sound i-f which is applied through a ceramic filter to a CA-3089 FM i-f amplifier/detector integrated circuit to recover one channel of audio.

Troubleshooting

After installation and about four weeks service, the displayed signal strength became intermittent with a corresponding drop in picture quality. Since the signal was intermittent and seemed to be affected by the fine-tuning control, I assumed I had a receiver problem. I took the receiver to the

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Drake factory a few miles south and asked for warranty service. While I watched and waited, the Drake service personnel put the receiver on the bench and fired it up. When, after fifteen minutes, the signal strength never dropped below a four, I conceded the problem was not the receiver. I borrowed an LNA from another TVRO owner and sure enough, signal strength again pinned the meter.

Avantek charges $50.00 per hour to repair out-of-warranty LNAs. If the first transistor is zapped, the parts cost starts at $125. With the recent drop in LNA prices, Avantek will call you when the repair estimate gets close to the price of a new LNA. I sent the LNA back to California by UPS, and three weeks later it was returned with new warranty seals and a calibration chart showing a 100-degree noise figure at the center of the band.

After that repair I had several more weeks of excellent service—I hadn't missed a football game I wanted to see. But one night after a rain—no picture, no snow, no hiss, nothing. No signal strength or snow implied a bad receiver. I couldn't borrow an LNA this time to check, but most receivers have some snow even with the LNA disconnected. I went back to the factory again, but the efficient service folks again found nothing wrong. Could the LNA have died so soon after repair? I ordered another LNA by telephone (I wanted a spare anyway) and two days later it arrived. After installation there was still no picture, but I had found that the i-f gain control was set too low to show snow before I installed the new LNA. What's left? Coax? Connectors? I took out the L-shaped, N-type adaptor I had originally installed at the rear of the LNA and found a film of water inside the connector. After blowing it dry and reconnecting the LNA, I had perfect pictures again! Moral: Keep your connectors dry!

Before I had fastened the dish to the ground, a gust of southerly wind had tipped it over. It landed on one side and flattened the edge of three of the segments. I thought I was in big trouble. All the articles I had read said that the parabolic surface must be precise, with any deviation causing almost total lack of signal because of destructive interference within the antenna. So when I stood the dish up again and pointed it in the right direction, I was expecting the noisy, barely-discernible signal I found. But, at the angle the dish fell, one of the feed support legs could have been bent moving the feed from the center of the focus. So I went through the dish alignment steps again and found I was locked on a new sidelobe, a distortion in the antenna pattern. The main lobe, once I found it, was almost as good as before the fall.

Recommendations

Don't attempt to build from scratch unless you have lots of time, test equipment for all the frequencies required, or exceptional skill.

If you buy a kit for any of the three major subsections, don't buy another kit for another subsection unless you fall in one or more of the categories above. Someone with two different subsystem kits and no microwave test equipment will have to be very lucky to get a station up in reasonable time.

If you must experiment, get a system working *first*, then substitute at the major component level (like receiver, antenna, etc.).

Don't try to get by cheaply—Mother Nature is not kind at 4 GHz, and 22,000 miles is a lot of path loss. ■

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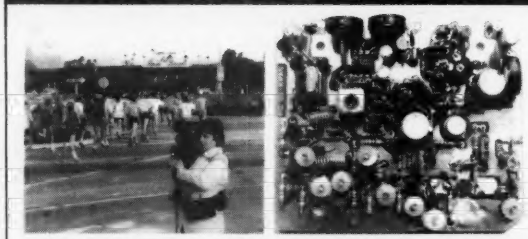

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IC-3AT 220 MHz, TTP	299.95	239.95
IC-4AT 440 MHz, TTP	299.95	239.95

Accessories for Deluxe models	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	67.50
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger - all batteries	69.00
BC-60 6-position gang charger, all batts	SALE 359.95
BC-16U Wall charger - BP7/BP8	10.00
Accessories for both models	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	39.50
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All This and PCII!

Would you like a fully-programmable Morse keyboard that will balance your checkbook and play Sousa marches? Then read on!

The idea of using the Radio Shack/Sharp pocket computer as a memory keyer has been a goal of mine since Wayne Green, publisher of *73*, first suggested it in an editorial several years ago. The original pocket computer proved to be much too slow and lacked a complex Basic interpreter. Recently, however, I heard the new PCII playing *The Stars and Stripes Forever* at the local Radio Shack and reasoned that the sound function, a programmably-controlled "beeper," could be employed to turn the PCII into the first truly portable memory keyboard.

At the going price of $199, I could afford only the computer. Consequently, the memory keyer that evolved does not use a printer or additional memory. As an added bonus, no modifications are made to the computer, and the interface can be built in less than an hour.

```
 2 C=0:J=0:GOTO 12
 4 J=LEN (B$)
 6 C=C+1
 8 GOTO 14
12 A$=INKEY$: IF A$=" " THEN 12
14 IF A$="A" THEN LET A$="12": GOTO 100
16 IF A$="B" THEN LET A$="2111": GOTO 100
   (THE REST OF THE LETTERS AND NUMBERS ARE
   ENTERED IN THE SAME WAY.)
86 IF A$=")" THEN 120
88 IF A$="/" THEN 124
90 IF A$="*" THEN 126
92 IF A$="+" THEN 128
94 IF A$="-" THEN 130
96 IF A$="=" THEN 132
98 GOTO 12
100 L=LEN(A$)
102 FOR X=1 TO L
104 C$=MID$(A$,X,1)
106 IF C$="1" THEN GOSUB 134
108 IF C$="2" THEN GOSUB 136
112 NEXT X
114 IF C=J THEN 2
116 C<J THEN 6
118 GOTO 12
120 F$=" ": INPUT F$
122 GOTO 12
124 B$=" ":B$=F$: GOTO 4
126 B$=" ":B$="DE W4FXI": GOTO 4
128 B$=" ":B$="UR RST IS": GOTO 4
130 B$=" ":B$="QTH RADFORD VA": GOTO 4
132 B$=" ":B$="NAME BOB": GOTO 4
134 BEEP 1,8,100: RETURN
136 BEEP 1,8,300: RETURN
138 END
```

Fig. 1. Morse program for PCII.

The Program

As a CW enthusiast, I wanted a keyer with both fixed and variable memories and an active keyboard for long rag-chewing sessions. The program, adapted from concepts of Allan Joffe,* meets those requirements and is a delight to operate. (See Fig. 1.)

The program uses an INKEY$ routine to keep the keyboard active, employs the ")" key as an input for a variable memory, and has four fixed memories accessible as keys "*", "+", "=", and "−". When a key is depressed, the character produced is translated into a number in which a dot is a 1 and a dash is a 2. Consequently, A becomes 1-2 and B becomes 2-1-1-1. The MID$ routine peels off the numbers one at a time and sends the results to the GOSUB routine, where a timed beep is produced.

Using the Keyer

Carefully type in the program. Be sure to change lines 126, 130, and 132 to your call, QTH, and name. Put the PCII in the run mode, type and enter "run." The keyboard is now "active," and depressing any letter or number key will send the code through the beeper. I would recommend that you practice using the keyboard to develop a feel for the timing before you actually put it on the air. By modifying the length of the beeps, lines 134 and 136, one can send properly-timed code up to about 25 words per minute.

The effective use of the variable and fixed memories

*Joffe, Allan S., "Morse Resource —Part 1," *80 Microcomputing*, August, 1981.

adds immeasurably to real CW enjoyment. Imagine you are listening on 15 meters and hear BY1PK. You immediately depress "?" to access your variable memory and type in and enter his call. When he signs, you hit "/" to send what was in the variable memory—his call. Want to send it again? Simply hit "/" again. Now depress and hold the "*" and your call will hit the airways. Use the active keyboard to enter the proper closing.

Let's assume BY1PK hears you and responds. You're ready! Depress "/" to send his call, and then depress and hold the "*" for yours. Continue the QSO by depressing and holding "−", "+", and "=" in turn. Remember your keyboard is active, so you can add the RST and other comments at the appropriate times.

If you are like me and BY1PK did not respond, you can always load a CQ into the variable memory and then change the CQ to the call of whomever responds.

The Interface

The PCII comes equipped with a 60-pin expansion port. However, Radio Shack does not tell you what the 60 pins are for. I asked myself a simple question, "Would the folks at Radio Shack/Sharp design a pocket computer that enables the programmer to control the number, frequency, and duration of a beep and not access that information to the outside world?" Of course not!

Pick up the PCII, hold it horizontally, and look directly at the expansion port. Use just the top row and count from left to right to pin four. Pin four outputs the beep. Now examine the bottom row of pins. Count from right to left to pin 13. That's your ground.

The beeps are routed from the computer to the interface on a shielded cable. Choose a cable size that will enable you to insert 1/8 inch of the center conductor directly into pin four and braid into pin 13. On the other end of the cable, attach a miniature plug. Once you have inserted the cable into the computer, the beep goes off and the audio signal is routed on the cable to the interface where it will be amplified and converted into dc to key your rig. Sounds complicated, but it's not. The amplifier is pre-assembled for you by Radio Shack. They call it a Mini-Amplifier, and it sells for $11.95. Attach the cable you just prepared to the input of the Mini-Amplifier. Remember to put in a 9-volt battery.

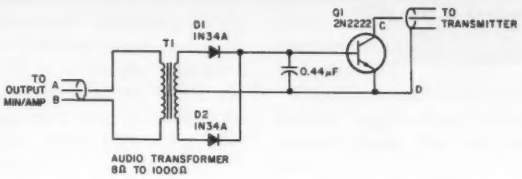

Fig. 2. The rectifier circuit.

The rectifier circuit (see Fig. 2) can be built on a piece of 1- by 3-inch perfboard. Attach the Mini-Amplifier output to points A and B. Attach another piece of shielded cable from points C and D to the keyer jack of your rig. Turn on the amplifier/rectifier circuit, your PCII, and rig. Enjoy great CW! After you see how well it works, I would suggest putting the entire interface in a metal case and routing the on/off volume control and jacks to the exterior of the case. ■

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Do Volunteer Examiners Work? A 73 Special Report

National VEC W5YI says yes. He should know.

There is much confusion and misinformation about volunteer amateur-radio examinations. The US government is now completely out of the ham testing business. The following is the history of volunteer examinations and how one amateur seeks to make Amateur Radio Service testing readily available nationwide. Texas amateur Fred Maia W5YI is a longtime ham, a QCWA member, and a member of Mensa, the high-IQ group. He publishes the internationally acclaimed W5YI Report, *a twice-a-month ham-radio newsletter. He was the first to be appointed a VEC in all regions. The only other national VEC is the ARRL. Here is his story complete with everything you ever wondered about the FCC's volunteer program.*

Turning ham-radio testing over to the amateur community really didn't come as a surprise to us. I predicted it nearly four years before it happened. The handwriting was on the wall when the FCC started abolishing its commercial radiotelephone license program. The Third Class Permit was the first to go. As far back as 1980, FCC Chairman Charles Ferris was on record as supporting broadcast industry testing procedures rather than those of the FCC. He said that government administered tests "do not account for experience and common sense...and were susceptible to 'cramming at the last minute.'" He said that "the government may be able to remove itself from the testing process without any adverse impact."

Ferris' statement also came at a time when Dick Bash KL7IHP's *Final Exam* was at its pinnacle. His book listed the verbatim FCC questions and answers to amateur-radio exams. It sold by the thousands. Bash got much of his material from amateurs, who after taking FCC tests, returned the "feedback" cards that he inserted in his book. In all fairness to Bash, his book wasn't that much different from the League's previously published red-and-black *License Manual*. It was just more accurate.

Every year, it seems, the FCC runs out of money and issues its now classic "interim guidelines statement" declaring that routine services will stop until Congress acts on appropriations. Fiscal 1981 (which started in October, 1980) was no exception. With serious FCC budgetary problems and personnel cutbacks, amateur-radio testing was beginning to look like an expensive and unnecessary exercise in futility to them.

Putting two and two together, I wrote a front-page article in my September 1, 1980, *W5YI Report* about the FCC getting out of the testing business. It was an obvious and logical conclusion to me. Few amateurs put stock in my observations.

Volunteer Testing Becomes a Reality

Senator Barry Goldwater K7UGA, politically the nation's highest-ranking amateur-radio operator, played the major role in what was to become Public Law 97-259. Legislation covering volunteer examinations actually had its start, however, in the spring of 1981, when William E. Dannemeyer (R-California) proposed a Communications Act Amendment that would allow volunteers to legally administer the Novice examination. Even though Novice exams had been administered by volunteers for decades, Dannemeyer said: "Government rules forbid volunteer help by a private citizen." Dannemeyer added that: "This practice saves the FCC money...and is more convenient for the amateur community by eliminating the need to travel to an FCC field office, which is often a good distance away." He felt that the law should provide for volunteer amateur-radio operator testing.

Goldwater picked up on this theme and proposed as a saving to taxpayers that *all* amateur-radio operator examinations be prepared, administered, and graded by ham volunteers. Congress approved volunteer testing as part of the "Communications Technical Amendments Act of 1982." It was signed into law by President Reagan on September 13, 1982. On October 22, 1982, the ARRL filed a petition seeking to implement the volunteer testing portion of Public Law 97-259.

The following year, a Report and Order was adopted by the FCC authorizing volunteer ham testing. A system of regional VECs (Volunteer Examiner Coordinators) was established to act as a liaison beween the FCC's licensing facility and each team of three volunteer examiners who would administer the tests. The American Radio Relay League had wanted a single national non-profit organization to be appointed as amateur-radio operator test administrator. Instead, the FCC embarked on the regional VEC concept "to generate sufficient interest in the VEC function and to get a significant amount of participation in the program."

League Balks at Becoming a VEC

Everyone thought that

once volunteer testing was approved, the ARRL would immediately apply to become a VEC in all regions. Such was not the case. The League said that they wouldn't apply to become a VEC unless out-of-pocket expense reimbursement was authorized. At the League's urging, on November 3, 1983, Goldwater authored a bill (S.1045) to permit volunteers to be reimbursed by applicants up to $4.00 for ham examinations above the Novice level. A provision was made for increases in the expense reimbursement based on inflation.

Meanwhile, the FCC said that 1984 would be the last year that they would administer amateur-radio operator examinations, and even then only on a quarterly basis. Amateurs began to feel uneasy because it was beginning to appear that future amateur testing would be very scarce . . . and possibly nonexistent. On December 8, 1983, President Reagan signed FCC budgetary legislation which had ham-test-expense reimbursement tagged to it. It still had to be implemented by the FCC.

By the spring of 1984, about a half dozen VECs had been approved by the Commission and they began to accredit volunteer examiners and give ham tests. There were many complaints among VECs about lack of cooperation from the League. It got the volunteer examination program off to a rocky start. The ARRL still had not applied to become a VEC, stating that they were waiting for the Commission to establish amateur-radio-operator exam reimbursement.

The FCC issued a Notice of Proposed Rulemaking on March 9, 1984, asking the amateur community how expense reimbursement should be handled. The last year of FCC testing was half over when we filed our proposal with the Commission to become a VEC in all regions. Even though expense reimbursement had not been approved, we agreed to become a VEC based on a unique concept. Instead of amateur-radio-operator testing materials being provided by the VEC, our VEs would be allowed to purchase them in the independent publishing marketplace.

Even though the League said a volunteer testing program without expense recoupment would bankrupt them, it didn't appear to us that being a national VEC would be that expensive a proposition, particularly if the needed materials were commercially available. On June 12, 1984, the FCC approved our proposal and appointed us a VEC in all regions—the first VEC to be so authorized. The Commission issued us instructions shortly thereafter. Our program accredits only Extra-class amateurs as volunteer examiners, since only they can administer all written exams and *any* of the code tests.

It also appeared to us that amateur radio was entering the doldrums again. Ham radio showed great growth in the 50s. Amateur radio didn't move forward again until the mid-1970s, when the FCC discontinued charging fees for its ham tests. There has been basically no growth in the number of amateur-radio operators during the past two years.

If a volunteer licensing program was to work, we reasoned that it would require the following elements:

- Simple and streamlined procedures
- Wide availability
- A minimum of waiting to administer the tests
- Easy administration
- An inexpensive cost
- Well-publicized availability

We kept these points in mind when making decisions regarding our program.

Volunteer Examiner Coordinator

The VEC does not give tests. A VEC merely coordinates the testing and licensing function and acts as the link between the government and the volunteer examining team. A VEC also:

1) Recruits and accredits volunteer examiners and issues accreditation documents.

2) Keeps volunteer examiners aware of additions and amendments to program rules.

3) Provides for or approves amateur testing materials.

4) Provides for necessary test-session forms such as FCC Form 610, application forms, test reports, Certificates of Successful Completion, etc.

5) Collects successful candidates' application forms, answer sheets, and test results.

6) Prepares and maintains records of testing sessions.

7) Screens and forwards successful applications for amateur-radio operator licenses to the FCC in Gettysburg PA.

8) Resolves defects in FCC Form 610 made by applicants.

9) Evaluates test questions to ensure clarity and accuracy and forwards recommendations to the FCC.

10) Determines amount of out-of-pocket reimbursable expenses and ensures that annual expense certification documents are forwarded to the FCC.

The Volunteer Examiner

The FCC requires that three volunteers administer amateur-radio operator examinations above the Novice level. The volunteer testing program rules require that the written exams be administered by amateurs holding higher class licenses than those tested. Only Extra-class volunteer examiners can administer the 13- and 20-wpm code tests. In view of this, we only accredit Extra-class amateurs in our program.

To be a VE under our program, you simply must send us the following *signed* statement along with a photocopy of your current FCC amateur Extra-class license: *"I am a currently licensed Extra-class amateur-radio operator and wish to be a volunteer examiner. I have never had my station or operator license revoked or suspended. I do not own a significant interest in nor am an employee of any company or entity engaged in making, preparing, or distributing amateur-radio equipment or license-preparation materials. My age is at least 18 years old."* There are no

The United States of America

This certifies that

NUMBER: VE-

DATE:

is a currently licensed AMATEUR EXTRA CLASS Amateur Radio Operator and is authorized, subject to Orders, Rules and Regulations of the

FEDERAL COMMUNICATIONS COMMISSION
to be a VOLUNTEER EXAMINER in the
AMATEUR RADIO SERVICE

This Authority is granted under and subject to the Terms and Conditions of Public Law 97-259 (September 14, 1982) authorizing the use of volunteers to prepare and administer amateur radio operator examinations, Report and Order PR Docket 83-27, FCC 83-433 (September 22, 1983) and 47 CFR Part 97.31 of the Commissions Rules (December 1, 1983.) Neither this Authority nor the rights certified herein shall be assigned or otherwise transferred to any other person.

This Authority is valid for an indeterminate period of time and to the extent required by the Volunteer Amateur Radio Operator Program as defined in the Commission's Rules.

For the FEDERAL COMMUNICATIONS COMMISSION

FREDERICK O. MAIA, W5YI, Coordinator

Fig. 1. Volunteer examiner certificate.

other requirements and the accreditation is for an indefinite period of time. (Send to: W5YI-VEC, PO Box 10101, Dallas TX 75207.) We also have a volunteer examiner certificate (see Fig. 1) available for $1.00, but it is not necessary that a VE have this.

Since it takes a three-man accredited VE team to give ham tests, it is important that you recruit at least two additional (and preferably more) Extra-class amateurs in your area to assist with test administration. No examinations can be given without three fully accredited VEs. Both large-scale and small test sessions (as few as a single applicant) can be conducted.

So You Want To Give A Test

Until recently, a VEC had to notify the FCC 30 days in advance of an amateur-radio operator testing session. This required that we be notified a minimum of six weeks in advance. We wrote the FCC last November asking for a modification of this rule. The purpose of this notification was to provide local FCC field offices with testing information so that they can properly respond to amateur-radio operator test inquiries. We felt that the letter writing was burdensome, required excessive advance planning on the part of the VE, and we noted that some testing sessions (such as those involving ham-radio graduating classes or handicapped individuals) are not open to the public.

Effective January, 1985, the FCC notification requirements have been eliminated. This has greatly speeded up test administration. VEs now only have to advise the VEC that a test session will be held and request appropriate testing information. This can even be done by telephone! The test session can then be held immediately. All we require now in the way of advance information is the city and state that the test will take place in, the date of examination, and the name, callsign, address, and telephone number of the volunteer examiner.

The VEs must make a public announcement before each examination session. The announcement must show the amount of reimbursement fee required from each candidate and where and how it is to be paid. This public announcement can be in any form, including an announcement at a club meeting, club bulletin release, posted handbill at the local ham equipment supplier, or an announcement on your local amateur repeater.

Testing Materials

The enabling legislation not only authorized volunteer ham-test administration, but *preparation* by amateurs as well. During 1982 and 1983, the FCC mounted a campaign to develop banks of questions which would form the various amateur-radio examination pools. It was decided that ten times the number of questions as needed in any one test would be generated.

The amateur community was invited to submit questions for use in the examinations—one question to a sheet of paper complete with the proper answer and reference source confirming the correct answer. The ARRL and Dayton Amateur Radio Association contributed the most questions and it took over a year to come up with all of the needed questions. Many left a lot to be desired.

The FCC released the questions to the public in various PR bulletins. Many amateurs not familiar with the volunteer examining program were shocked to learn that the actual questions were now publicly available from the Commission. Only the questions and not the answers were released. Many questions had more than one right answer. We filed a Freedom of Information Act request with the FCC for the answers. This was approved and I sent the FCC's contract copying service to the Personal Radio Branch in Washington DC to get them. We later forwarded the answers to all known amateur-radio operator license-preparation material publishers.

The ARRL went on record as stating that, in their opinion, not only the questions, but the multiple-choice answer and distractors (wrong answers) should be part of the question pool as well. The FCC said that any amateur that memorizes all questions in the pool would have to have knowledge of the subject since the number of questions was so vast (see Fig. 2).

The Advanced questions were due for revision in February and may have been already revised by the time you read this. Our understanding is that very few questions will be changed, however. The FCC revises the question pools once a year on a staggered quarterly basis. Volunteer examiners submit their recommendations for question changes, deletions, and additions, according to the schedule in Fig. 2, to their VECs, who in turn forward them to the FCC.

On June 27, 1984, the ARRL applied for VEC status in all regions to take effect upon implementation of expense reimbursement. It was the first instance that a license-preparation material publisher had applied to coordinate tests. As a prerequisite to the ARRL becoming a VEC in all regions, the League was required to release their multiple-choice questions to the public and place them in the public domain so as not to gain a publishing advantage. The League sent their multiple-choice questions and answers to all other VECs and known license-preparation publishers. They were advised that they could republish them if they wished. At least two of them did (West Radio School and AMECO) and more are sure to. The ARRL was approved as a national VEC on July 21st.

License-Preparation Materials

Widespread availability of adequate testing and license-preparation materials must occur if volunteer testing in the Amateur Radio Service is to succeed. We have approved the tests of the West Radio School (Gordon West WB6NOA, 2414 College Drive, Costa Mesa CA 92626; (714)-549-5000) for use by our VEs. Gordon has ten different versions of every written and code test. We merely advise VEs which versions should be administered. In the interest of making volunteer amateur testing more readily available, Gordon has reduced the price of his testing series to only $10.00 for *all* of his testing materials.

The West Radio School *VE Test Set* contains ten dif-

License Class	Written Element	Question Pool	FCC Bulletin	Current Version	Questions Reviewed
Novice	Element 2	200 questions	PR-1035A	August, 1984	July 1
Technician/ General	Element 3	500 questions	PR-1035B	November, 1984	October 1
Advanced	Element 4A	500 questions	PR-1035C	April, 1984	January 1
Extra	Element 4B	400 questions	PR-1035D	April, 1984	April 1

Fig. 2. The FCC question pool.

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Amtorsoft — Includes all the features of Hamtext but is for use with AMTOR ONLY. The Apple program is available only as a Hamtext/Amtorsoft combination.

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FSK Output — Open Collector +40 VDC Max. Polarity can be reversed.

Scope Output — 10K ohm output impedance.

PTT Output — Open Collector +40 VDC Max.

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ferent versions of the Element 3, Element 4A, and Element 4B written examinations and ten versions each of the 5-wpm, 13-wpm, and 20-wpm code tests on three cassette tapes. You can photocopy as many blank test sheets as you need once we tell you which one to administer. The code tests are excellent. You don't have to say a thing. All of the testing instructions—even a practice copying session—is right on the tape. The test set includes all of the answer sheets for the VE team. The $10.00 price is actually under his cost, but he wants this as his contribution to the volunteer testing program.

Once the test questions and answers are known, the pass rate should dramatically increase. Gordon West, owner of the West Radio School, is a nationally recognized writer and educator. He teaches his ham classes based on the actual questions in the pool. While the VE program is currently averaging a 48% success rate nationally, a recent West graduating class had an 87% pass rate. (172 students out of 197 administered Element 3 passed!) Clubs that plan license upgrade classes would do well to use West Radio School's manuals, which are based on the VE question pools.

Actually, we will approve any credible amateur-radio operator tests for use in our VE program. Effective January 12, 1987, the volunteer examiner as well as the VEC may select the test questions/answers and design the examinations.

Marty Schwartz KB2LO of AMECO is in the process of releasing revised test manuals which not only have the approved questions, but also multiple-choice questions, answers, and distractors to be used for testing. AMECO's tests, like those of West Radio, use the ARRL multiple-choice questions. Dick Bash also advises he will have testing materials available eventually. A serious problem facing ham-license-preparation publishers is that test questions are sometimes changed, making previous manuals and tests obsolete.

The Paperwork

No one likes paperwork, least of all us. We keep it to an absolute minimum. If the FCC doesn't require it, we don't. And there isn't much that is required. We basically only have four forms:

The FCC Form 610 (Application for Amateur Radio Station and/or Operator License) is, by far, the most important. The other required forms are the Certificate of Successful Completion of Examination, the Manifest of Applicants, and the Examination Test Report.

Only the current version (June, 1984) of Form 610 is suitable for the volunteer testing program and it is very important that it be properly filled out. Our instructions to the VE team cover this. Defective applications cause delays and unbelievable time-consuming work and expense for us.

We issue every volunteer examiner an accreditation card and a distinctive accreditation number. The Manifest of Applicants merely lists the examinees that were tested and their pass/fail results by license class. The Examination Test Report reports the number of applicants that upgraded (or failed to upgrade) and the pass/fail results for each element administered in the examination session.

A Certificate of Successful Completion of Examination has a dual purpose. It is issued to each candidate who scores a passing grade. When the applicant passes a required telegraphy examination for a higher class operator license but fails the required written examination, it serves as evidence for credit for the telegraphy examination at a subsequent examination session held within 365 days of the date of issue.

When the candidate already has an FCC-issued amateur-radio license and scores a passing grade on all examination elements required for a higher class operator license, it serves as evidence that the candidate is authorized to operate on a temporary basis with the rights and privileges of the higher operating class up to 365 days.

Universal "identifiers" are temporarily appended to an applicant's callsign after he upgrades while awaiting receipt of his new license from the FCC. This is so the applicant may immediately begin using newly obtained privileges. On CW, the applicant signs his callsign followed by the slant bar (/) and the designator. On voice, the word "temporary" followed by the identifier is used. The temporary identifiers are:

KT—Technician
AG—General
AA—Advanced
AE—Extra

Temporary operating authority—the so-called "instant-upgrade" privileges—has been extended from 90 days to one year to coincide with the terms of a code credit certificate.

The VE must return the paperwork to the VEC within ten days of test administration, and the VEC must, in turn, return it to the FCC's Gettysburg, Pennsylvania, licensing facility. The paperwork consists of the completed FCC Form 610, a photocopy of the applicant's license, and their answer sheets. (Only the answer sheets. It is not necessary to return the test itself to the VEC.)

Where's the Nearest Exam?

We get several inquiries weekly from amateurs that would like to upgrade and want to know where we are coordinating amateur-radio operator examinations nearby. While we have dozens of examination sessions scheduled, our area of VEC jurisdiction is worldwide. Frequently, we have to advise the applicant to contact our nearest volunteer examiner. If an accredited VE is not nearby, we ask the applicant to locate the closest amateur-radio club or Extra-class amateur and have them get in touch with us so that we can possibly schedule a testing session. For those of you who want to upgrade, we suggest that approach. There really is not examination shortage, merely a shortage of volunteers to administer them.

Be the Testing Authority in Your Area

Amateur-radio operators have always volunteered their services in time of need. Now it is time to help ourselves. Volunteer examiners will have a profound influence on the "health" of the Amateur Radio Service. There was no growth in the service last year—about a third less amateurs upgraded. Growth is important to our future...and our country's future.

The VE plays an important role in maintaining the integrity of the volunteer examiner program. Amateur radio can only be as good as its operators, and it is the VE that largely determines who they will be. VEs also bear an important public relations burden. They are expected to be the amateur testing and licensing expert in their area.

If you are an Extra-class amateur-radio operator and would like to participate in the volunteer examiner program, just send us a photocopy of your license and the required signed statement and we will set you up in the amateur testing business at once. Send to: W5YI-VEC, PO Box 10101, Dallas TX 75207. Many VEs give tests on a monthly basis—some before each club meeting. It's really quite easy! Let us hear from you. ■

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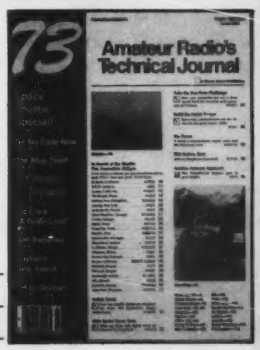

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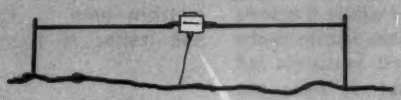

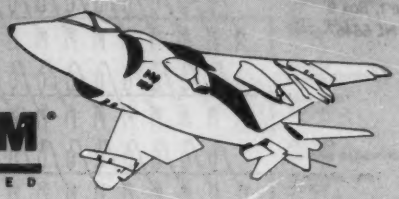

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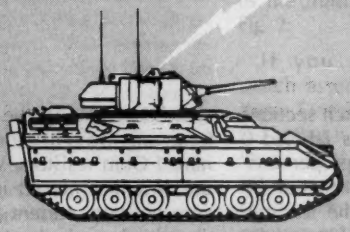

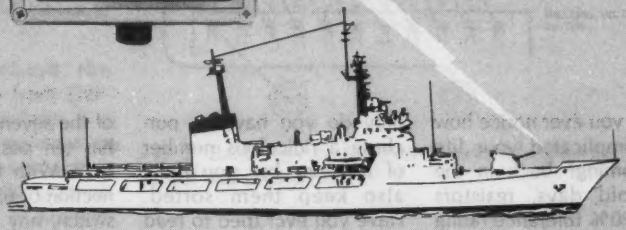

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The Incredible Digiohm

How to put ten million resistors in the palm of your hand? Build the ultimate substitution box.

Did you ever notice how complicated your life is becoming? Back in the good old days, resistors with a 20% tolerance rating were basic in all electronic circuitry. Through the years we have "progressed" through the 20% to 10% to 5% to 1% tolerance resistors. Granted there are many circuits where the 20% resistors are still used quite extensively, but as we strive for higher precision, lower noise, higher speed, lower cost, etc., we are seeing an increasing use of 1% resistors.

A listing of standard 1% resistor values for values from ten to one million Ohms contains over 480 different resistor values. Not only do you have to purchase a ridiculous number of resistors, but you must also keep them sorted. Have you ever tried to read the color code on a 1%, ¼-W resistor? Next to impossible! If you can read five color bands on a resistor that is only ¼" long, you're in the wrong hobby, you should be a stamp collector. What's the answer to this problem? Read on.

Digiohm, the portable resistance box, was designed to make life simple again. Digiohm is capable of any of ten million resistance values from 0 to 9,999,999 Ohms. Digiohm uses a lever-operated switch to dial in any resistance value. Each of the seven switch sections has ten positions labeled 0 to 9. With the proper connection of 63 resistors to the switch, any of the ten million resistance values can be selected in a matter of seconds just by dialing in the value needed. For less than $20.00 and some junk-box parts (and a little time), you can build Digiohm.

Digiohm's theory of operation is simple: When resistors are connected in series, the total resistance equals the sum of the individual resistances. Fig. 1 shows the schematic diagram of Digiohm. As you can see, there are seven identical decade (10-position) switch sections. Each switch section contains nine resistors. The switch section on the right (ones-unit switch) contains nine 1-Ohm resistors. When the switch is placed in the zero position, current flows directly through the switch without passing through any of the 1-Ohm resistors, and thus the resistance of the first switch section would be zero Ohms.

When the right switch is placed on any value 1 through 9, the corresponding number of 1-Ohm resistors are switched into the circuit to provide the appropriate resistance value.

The switch section second from the right is called the tens-unit switch. The tens-unit switch has nine 10-Ohm resistors connected in series and is capable of the following resistances: 0, 10, 20, 30, 40, 50, 60, 70, 80, and 90 Ohms. The other five

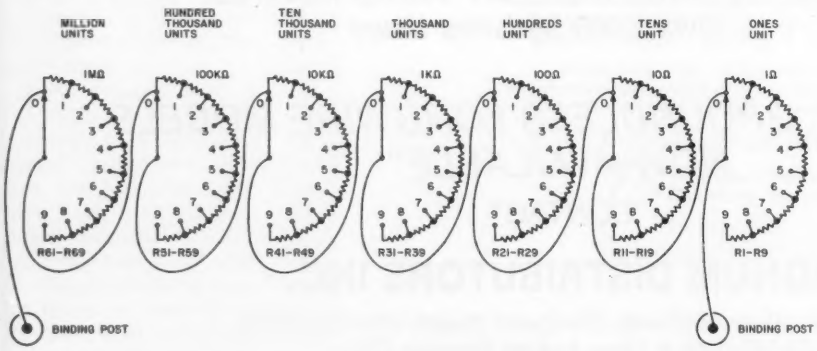

Fig. 1. Schematic.

Dial	Common Connection to:
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

Fig. 2. Truth table.

switches are similar. Each consists of nine resistors connected in series. See Fig. 1.

Before construction can begin, it will be necessary to purchase or locate the switch assembly, resistors, binding posts, and box. The binding posts and box are not critical and can be purchased locally if you do not have them in your junk box. The resistors are all ¼ Watt, 1% tolerance except for the 1-Ohm resistors, which are 5% tolerance. I used 5% for the 1-Ohm resistors because I had difficulty purchasing 1-Ohm resistors with a 1% tolerance rating at a reasonable price. Nine resistors of each of the values shown in the parts list are required; however, for the small extra cost, it is recommended that ten resistors of each value be purchased. The extra resistor may be necessary to replace a resistor which was damaged during construction.

The switch assembly is the most critical part of Digiohm. The basic switch section is a single-pole ten-position switch with the numbers 0 through 9 indicated. Fig. 2 shows the truth table for the switch. The switch assembly used to build Digiohm is a Digitran model 28531-7. This switch assembly is available from Electronic Design and Sales, as shown in the parts list. The model 28531-7 switch assembly is similar to a thumbwheel switch except that it has miniature levers which are used to operate the switch. The lever-operated switch has a couple of benefits over a thumbwheel switch. First, the switch can be reset to zero with a sweep of the hand, permitting instant reset. Second, the lever operation permits rapid switch setting when compared to the standard thumbwheel switch. Although I have discussed the thumbwheel-type switch, any ten-position switch can be used as long as it matches the truth table shown in Fig. 2.

If you purchase the switch assembly from Electronic Design and Sales, it is likely that it will appear as in Photo A. The switch assembly was originally planned to be installed in medical equipment before being purchased as surplus equipment. As Digiohm does not use multiplexer circuitry in conjunction with the decade switch, it will be necessary to remove the bus wiring. This can be done by cutting the wires between switch sections and using a soldering iron and needle-nose pliers to remove the short wire segments. It is a good idea to pull the short wire segments from the side opposite the conductor so that the conductor is not accidentally pulled from the board. After the wires have been removed, it will be necessary to remove the excess solder from the holes.

After the switch has been prepared, the resistors can be inserted and soldered to the switch. Fig. 3 shows the resistor connection. During construction you will dis-

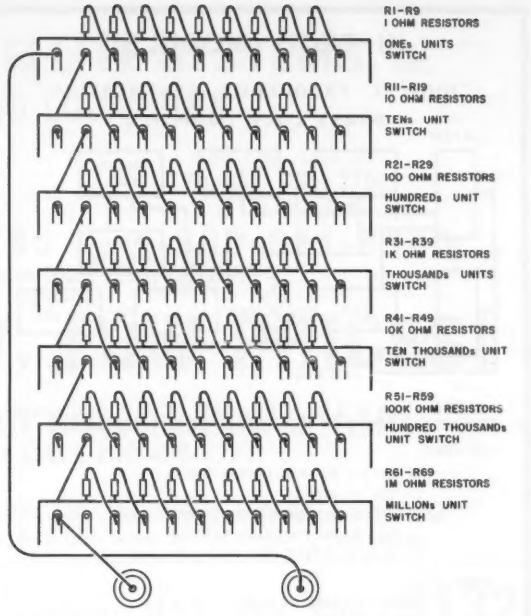

Fig. 3. Back view of the switch assembly showing resistor layout and connection.

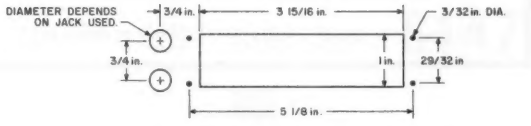

Fig. 4. Cutout dimensions.

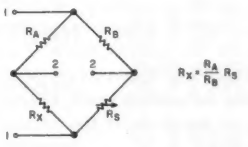

Fig. 5. Digiohm can be used as Rs in a Wheatstone-bridge circuit.

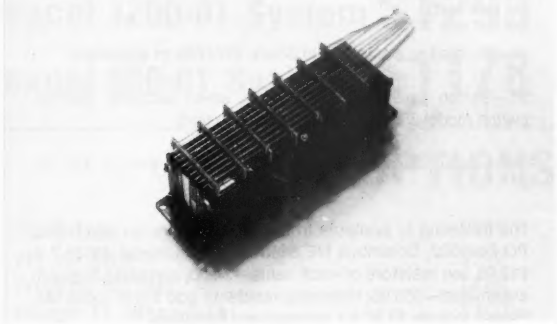

Photo A. Switch assembly with bus wiring.

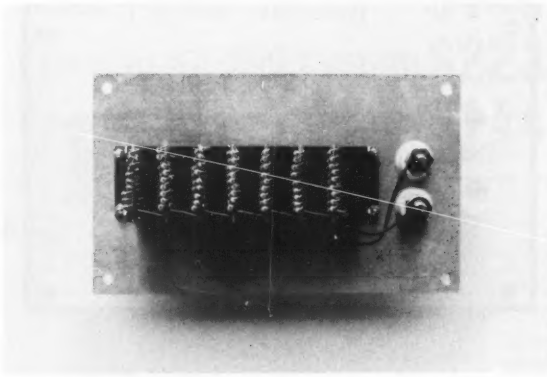

Photo B. Switch assembly with resistors and wiring installed.

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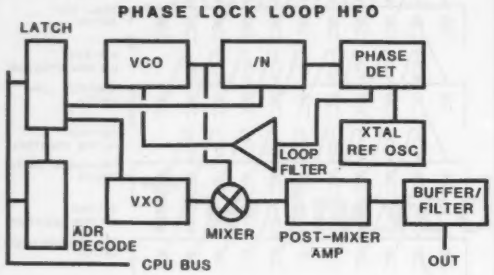

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cover why ¼-Watt resistors were specified: ¼-Watt resistors fit quite nicely, whereas ½-Watt resistors would have been more difficult to install. Some care should be taken when bending the resistor leads, as they can break from the resistor body.

After you have finished soldering the 63 resistors, you'll be ready for a change. The next step is to cut out the front panel for the mounting of the switch assembly and the binding posts. Fig. 4 shows the cutout dimensions. Layout is not critical. Before drilling holes for the binding posts, check their diameter.

Photo C. The finished product.

The next step is to mount the switch assembly and the binding posts. After you have mounted the switch assembly and binding posts, you will need to solder the two wires as shown in Photo B.

You are now ready to check out Digiohm. Connect an ohmmeter to the binding posts and set the ohmmeter to the lowest resistance range. With all the switches on Digiohm set to zero, the ohmmeter should read zero Ohms. Next, move the rightmost switch (ones-unit switch) through every position while watching the ohmmeter reading. The ohmmeter should correspond to the value set on Digiohm. After you have checked out the ones-unit switch, return it to zero and check the remaining switches in a similar manner. It will be necessary to set the ohmmeter to the appropriate range and zero it before checking each section.

If you run across a problem, it will most likely be a poor solder joint or the installation of a resistor with the wrong value. By using the above checkout, you should be able to locate the problem without much difficulty.

After you have completed the checkout and have made any required corrections, the front panel can be mounted. I used ½" rub-on vinyl letters to write the word Digiohm on the front panel. Photo C shows the finished product.

In addition to using it as a resistance substitution box, Digiohm can be used as Rs in the Wheatstone bridge shown in Fig. 5.

Whenever using Digiohm, you must be aware of its electrical specifications. Since ¼-Watt resistors are used, care must be taken not to exceed their rating. The Digitran model 28531-7 switch is rated for maximum switching of 28 volts ac or dc and 50 milliamps of resistive current. In the non-switching mode, the switch is rated at 1 Amp. The switch has a dielectric rating of 500 volts rms. These ratings are typical for thumbwheel-type switches.

If you build the Digiohm, you will find that it is a welcome addition to any hobbyist's bench. Good luck and happy switching. ■

Parts List

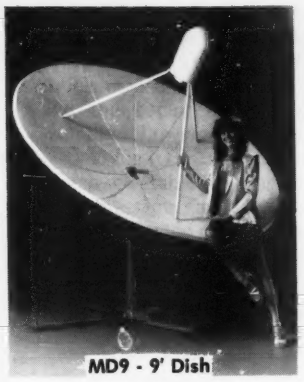
All resistors are ¼ Watt
R1 –R10 1 Ohm, 5%
R11–R20 10 Ohms, 1%
R21–R30 100 Ohms, 1%
R31–R40 1000 Ohms, 1%
R41–R50 10,000 Ohms, 1%
R51–R60 100,000 Ohms, 1%
R61–R70 1,000,000 Ohms, 1%
Note: Only nine resistors of each value are required for the project (see text).

J1–J2—binding posts, Radio Shack #274-662 or equivalent

S1—switch assembly, ten position, seven sections. Digitran switch model 28531-7 or equivalent (see text)

Box—Radio Shack #270-627 or equivalent size, 6¼" × 3¾" × 2"

The following is available from Electronic Design and Sales, PO Box 502, Columbus NE 68601: Digitran model 28531-7—$13.00, ten resistors of each value—$4.00, complete Digiohm assembled—$59.95; Nebraska residents add 3½% sales tax. Please include $2.50 for postage and handling.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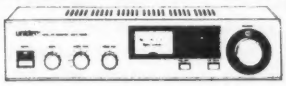

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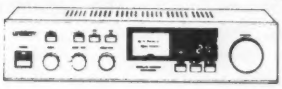

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Speech! Speech!

Here's a talking repeater controller that you can build in no time at all. It gives a whole new meaning to the word "vox"!

This project began as a voice identifier for one of our local repeaters. We wanted the ability to have several voice ID messages given at proper times during repeater operation.

After the ID software had been written, I noticed that only a little additional hardware and software would be needed to completely replace the repeater timer

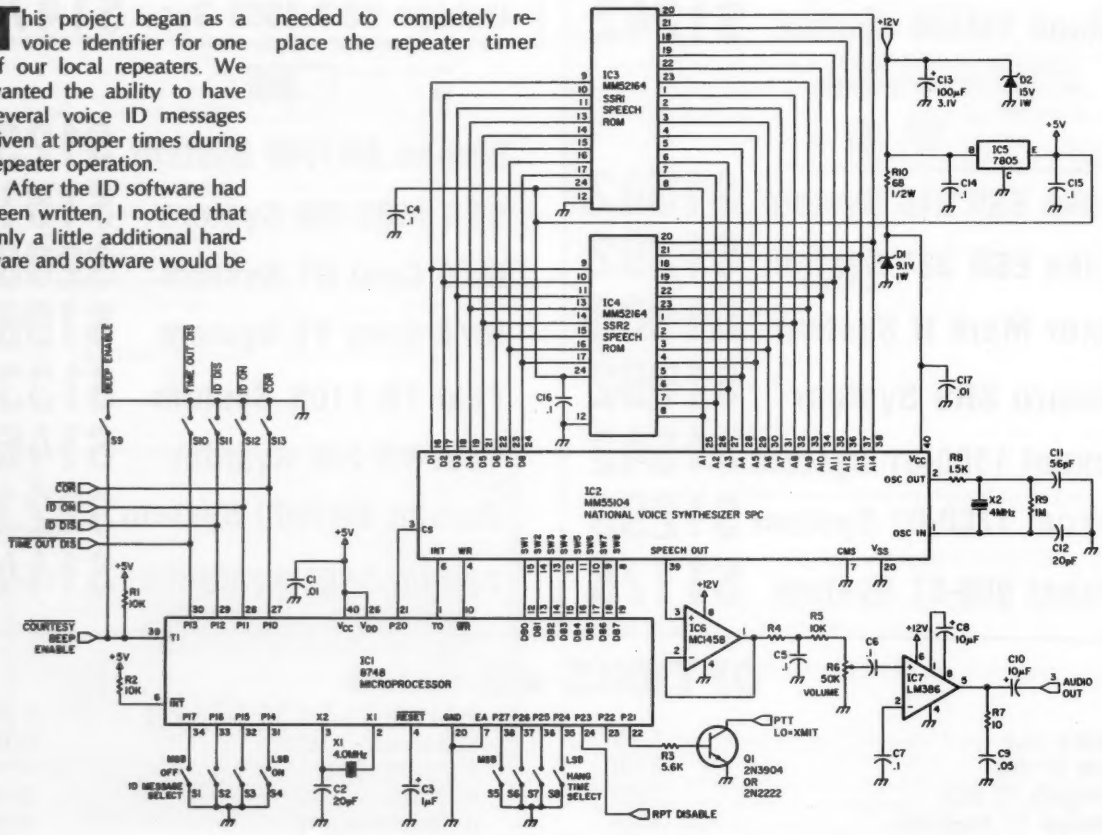

Fig. 1. Microprocessor repeater interface and identifier.

board in the all-Motorola repeater. I added what was needed to fully implement the repeater timer and squelch-tail timer functions, and the circuit ended up with the following features:

1) Voice ID with up to 15 switch-selectable messages. Each message can be individually selected or the messages will automatically cycle through, giving a different ID each ID period.

2) ID interval set in software. Ours is set to 9 minutes 45 seconds, but the period can be set to any length up to 255 seconds in 1-second increments.

3) Repeater time-out timer. Time-out time set in software. We set ours to 2 minutes, but any length up to 255 minutes may be specified in 1-second increments.

4) Time-out messages. Ours says "Time out is near" at 15 seconds before time out. Then at 2 seconds before time out, it says "Over and out!" Times and messages may be changed in software.

5) Adjustable hang timer. DIP switches allow selection of hang times in 0.5-second increments from 0 to 7.5 seconds.

6) Courtesy beep at the end of the hang time.

7) Independent disable lines brought out for all functions.

8) Single-supply +12-volt operation.

The Circuit

The circuit shown in Fig. 1 is built around just two major components, the Intel 8748 microprocessor and the National Digitalker chip set. The microprocessor handles all the timing and message-storage jobs while the Digitalker does the actual voice synthesis.

The Digitalker chip set contains a voice-synthesizer chip, the MM55104, and two speech ROMS which contain the data necessary to generate 143 different words and phrases. A word list showing the words available in the basic chip set is shown in Fig. 2. Two op amps are connected to the output of the voice synthesizer to provide for speech filtering and audio amplification to speaker-level audio. Since speech is digitally constructed in the Digitalker, the output needs to be low-pass filtered to remove extraneous digital noise and high-frequency by-products. This filtering helps the speech to sound more natural. Without it, the speech tends to sound somewhat garbled.

The 8748 microprocessor has attached to it three sets of DIP switches. The first set, S1–S4, is used to select the ID message to be sent at ID time. The second set, S5–S8, is used to select the hang-time length. The last set, S9–S13, is used for function controls. The micro has internal pull-up resistors for most of the lines going to the switches, so only one line, pin 39, needs external pull-up, provided by resistor R1. All lines going to the micro are TTL-compatible, so standard negative-true logic was adopted. That is, grounding a line causes its function to occur.

The function lines out of the processor allow you to control what it does. The COR line is the most important. It connects, with proper interface, to your repeater receiver. Bringing it low triggers all functions done by this circuit. The ID ON line enables you to have the micro continuously send the ID message you have selected with DIP switches S1–S4. The ID DISABLE line prevents ID generation

Word	Hex Address
THIS IS DIGITALKER	00
ONE	01
TWO	02
THREE	03
FOUR	04
FIVE	05
SIX	06
SEVEN	07
EIGHT	08
NINE	09
TEN	0A
ELEVEN	0B
TWELVE	0C
THIRTEEN	0D
FOURTEEN	0E
FIFTEEN	0F
SIXTEEN	10
SEVENTEEN	11
EIGHTEEN	12
NINETEEN	13
TWENTY	14
THIRTY	15
FORTY	16
FIFTY	17
SIXTY	18
SEVENTY	19
EIGHTY	1A
NINETY	1B
HUNDRED	1C
THOUSAND	1D
MILLION	1E
ZERO	1F
A	20
B	21
C	22
D	23
E	24
F	25
G	26
H	27
I	28
J	29
K	2A
L	2B
M	2C
N	2D
O	2E
P	2F
Q	30
R	31
S	32
T	33
U	34
V	35
W	36
X	37
Y	38
Z	39
AGAIN	3A
AMPERE	3B
AND	3C
AT	3D
CANCEL	3E
CASE	3F
CENT	40
400 Hz TONE	41
80 Hz TONE	42
20 MS SILENCE	43
40 MS SILENCE	44
80 MS SILENCE	45
160 MS SILENCE	46
320 MS SILENCE	47
CENTI-	48
CHECK	49
COMMA	4A
CONTROL	4B
DANGER	4C
DEGREE	4D
DOLLAR	4E
DOWN	4F
EQUAL	50
ERROR	51
FEET	52
FLOW	53
FUEL	54
GALLON	55
GO	56
GRAM	57
GREAT	58
GREATER	59
HAVE	5A
HIGH	5B
HIGHER	5C
HOUR	5D
IN	5E
INCHES	5F
IS	60
IT	61
KILO	62
LEFT	63
LESS	64
LESSER	65
LIMIT	66
LOW	67
LOWER	68
MARK	69
METER	6A
MILE	6B
MILLI-	6C
MINUS	6D
MINUTE	6E
NEAR	6F
NUMBER	70
OF	71
OFF	72
ON	73
OUT	74
OVER	75
PARENTHESIS	76
PERCENT	77
PLEASE	78
PLUS	79
POINT	7A
POUND	7B
PULSES	7C
RATE	7D
RE-	7E
READY	7F
RIGHT	80
-SS (makes plurals)	81
SECOND	82
SET	83
SPACE	84
SPEED	85
STAR	86
START	87
STOP	88
THAN	89
THE	8A
TIME	8B
TRY	8C
UP	8D
VOLT	8E
WEIGHT	8F

Fig. 2. Digitalker master word list.

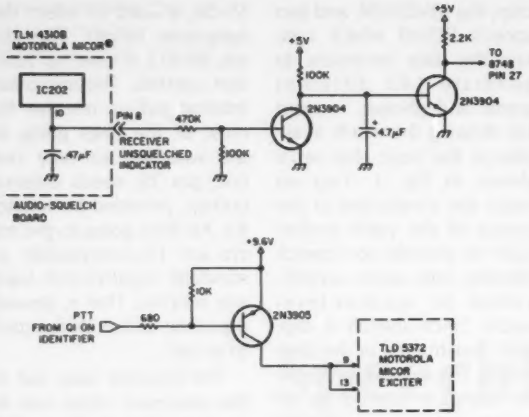

Fig. 3. The Motorola Micor receiver-to-microprocessor interface (top) and the identifier-exciter PTT interface.

whenever it is grounded. The TIME-OUT DISABLE line will defeat the internal time-out countdown and enable Q1 to stay enabled for as long as the COR line is held low.

The RPT DISABLE line is really powerful, as it should be. Whenever it is brought low, Q1 is immediately turned off and all functions are disabled. This line may also be used as a system reset. The BEEP ENABLE line, when grounded, allows the courtesy beep to occur at the end of the hang-time period.

Remember that with exception of the PTT line from Q1, all of these lines are limited to a maximum voltage of 5 volts, so be careful when interfacing this circuit into your repeater system. Although all of these lines are connected to on-board DIP switches for local control, they may also be connected to external, open-collector, TTL-level devices for remote control. When using external control, make sure that all on-board DIP switches are set to their open, or off, positions.

Construction and Operation

Our prototype circuit was built on a Vector 3677-2 DIP plugboard for ease of mounting in our repeater. I highly recommend building the circuit on plug-in boards. It surely makes debugging easier! Sockets were provided for all ICs. Since the circuit draws about 200 mA at 12 volts, a small TO-220-style heat sink was provided for the 5-volt regulator, IC7. Also note the 15-volt, 1-Watt zener across the 12-volt bus. That little diode, placed on each board in the repeater system, has saved my backside several times when lightning hit or when the main-supply pass transistor in the repeater shorted out. I highly recommend its use.

After the circuit is wired, check it over carefully several times. If possible, have a friend check it too. There isn't much to it, but the ICs are expensive, so don't take a chance.

After checking the wiring and before you insert the ICs in their sockets, check the power-supply voltages. Once you're satisfied that all is in readiness, set all DIP switches to their open position, plug in the ICs, attach a speaker, and apply power. The circuit should wake up with a short burst of unintelligible speech followed by silence.

Next, close all of the ID MESSAGE SELECT switches. Then close the ID ON switch. The circuit should then cycle through the ID messages that have been preprogrammed into the processor. If all is OK thus far, congratulations! The rest of the functions should now also work as advertised. You're ready to interface the circuit into your repeater.

Obviously, I can't show you how to interface to all equipment, but Fig. 3 shows the interface we used between the circuit and the Motorola Micor® audio-squelch and transmitter-exciter boards in our system.

Once interfaced into your system, all you'll need to do now is set the HANG-TIME SELECT switches. They are set in binary. First, determine the number of half-seconds of time desired. Then consult the chart in Fig. 4 for the proper switches to close. If all switches are open, there will be no squelch tail. The PTT will follow the COR signal immediately.

Here's how the system operates once successfully interfaced. When the receiver senses an incoming signal, it pulls the COR line low. Two events then occur. First, the PTT transistor is turned on to enable the repeater transmitter. Second, the ID interval timer is started and will continue to run until it times out. Voice ID is then certain to occur unless disabled by the ID DISABLE line, regardless of the state of the COR line.

When the COR line is released, or brought high again, the hang-time countdown is begun. When this countdown is complete (at a time set by the HANG-TIME SELECT switches), the processor turns off Q1, thereby turning off the transmitter. If the courtesy-beep line has been tied low, the processor will also command the voice synthesizer to send a short beep of 400-Hz tone. If the COR line is held low, about 15 seconds before

Parts List

Resistors		
R1, R2, R4, R5	10k, ¼ W, 10%	$ .24
R3	5.6k, ¼ W, 10%	.06
R6	Potentiometer, 50k	.59
R7	10 Ohm, ¼ W, 10%	.06
R8	1.5k, ¼ W, 10%	.06
R9	1 M, ¼ W, 10%	.06
R10	68 Ohm, ½ W, 10%	.06
Capacitors		
C1, C17	.01 uF, disc ceramic, 50 V	.40
C2, C12	20 pF, disc ceramic, 50 V	.40
C3	1.0 uF, electrolytic, 15 V	.59
C4–7, C14–16	0.1 uF, disc ceramic, 50 V	1.40
C8, C10	10 uF, electrolytic, 15 V	1.18
C9	.05 uF, disc ceramic, 50 V	.20
C11	56 pF, disc ceramic, 50 V	.20
C13	100 uF, electrolytic, 15 V	.69
IC1	Microprocessor, Intel 8748	*
IC2–4	National Digitalker chip set	35.00
IC5	LM7805 voltage regulator, 5 V	.79
IC6	MC1458 dual op amp	.59
IC7	LM386 power op amp	.89
D1	Zener diode, 9.1 V, 1 W	.25
D2	Zener diode, 15 V, 1 W	.25
Q1	Transistor, NPN 2N3904 or equivalent	.25
X1, X2	Crystal, 4.0 MHz	7.90
S1–S4, S5–S8	DIP switch, SPST, 4 position	2.38
S9–S13	DIP switch, SPST, 8 position	1.49
	PC board	*
	Socket, 40-pin DIP (two)	.98
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MRF435*	150W	42.00	90.00
MRF449	30W	12.00	27.00
MRF449A	30W	11.00	25.00
MRF450	50W	12.00	27.00
MRF450A	50W	12.00	27.00
MRF453	60W	15.00	33.00
MRF453A	60W	15.00	33.00
MRF454	80W	16.00	35.00
MRF454A	80W	16.00	35.00
MRF455	60W	12.00	27.00
MRF455A	60W	12.00	27.00
MRF458	80W	18.00	40.00
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MRF641	15W	18.00	—
MRF644	25W	23.00	—
MRF646	40W	24.00	59.00
MRF648	60W	29.50	69.00
SD1416	80W	29.50	—
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2N4427	1W	1.25	—
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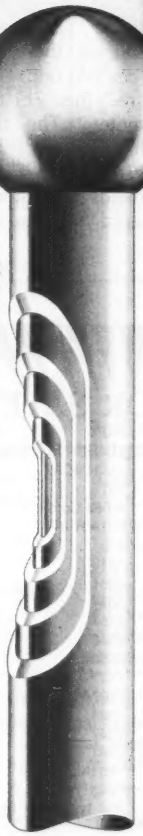

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0	0	0	0	0.0 sec.
0	0	0	1	0.5
0	0	1	0	1.0
0	0	1	1	1.5
0	1	0	0	2.0
0	1	0	1	2.5
0	1	1	0	3.0
0	1	1	1	3.5
1	0	0	0	4.0
1	0	0	1	4.5
1	0	1	0	5.0
1	0	1	1	5.5
1	1	0	0	6.0
1	1	0	1	6.5
1	1	1	0	7.0
1	1	1	1	7.5

Fig. 4 Hang-time switch settings.

time out a warning message will be sent by the voice synthesizer: *Time out is near.* At two seconds before time out, a second, final warning will be given: *Over and out!* The PTT output will then be deactivated until either the COR line is released and brought low again or the ID cycle is completed, at which time a voice ID message will be given and the PTT output deactivated again.

Holding the COR line low past time out will keep the transmitter off, but automatic ID with PTT activation will still occur at the end of every succeeding ID interval. If the synthesizer is speaking when the ID message is due, the ID message will immediately follow.

Messages

Although the word list seems at first glance to be somewhat limited, a little applied ingenuity can work wonders. For example, a sound-alike to the word "repeater" can be made by splicing the word "meter" (hex 6A) onto the utterance "re-" (hex 7E) to form "remeter." The difference is hardly noticeable on the air, especially if your users' minds are listening for the word "repeater"!

When we wanted to put in the phrase "high over East Tennessee," we used two splices. "East" was made up of the letter "E" spliced with the sound "SS" (hex 81). "Tennessee" was formed with "ten," "SS," and "C." Sneaky, huh?

Also, don't forget that many words can serve double duty such as "weight" and "wait," "one" and "won," "hour" and "our," "C" and "sea," "I" and "eye," etc. I am sure you can come up with many more.

Software

I thought long and hard about publishing the software I used, but decided not to do it. Since messages and times must be customized for each repeater owner's wishes, various addresses, pointers, and constants must be precisely programmed. How to determine them would be beyond the scope of this article. I will, however, furnish preprogrammed and customized microprocessors for a modest sum.

A version of software is also available for ID-only operation with no timers except those needed for identifier operation.

Conclusion

Voice synthesizers are becoming increasingly popular on repeaters across the country. This circuit provides an inexpensive way to add voice to your repeater, to demonstrate the claim that your repeater is "microprocessor controlled," and to eliminate those old and sometimes unreliable 555 timer circuits. For those who are interested, PC boards and microprocessors are available from the author.

I would like to thank Sam Kirby WB4HAP for building the prototype of this circuit and offering his repeater as the proving ground for its operation.■

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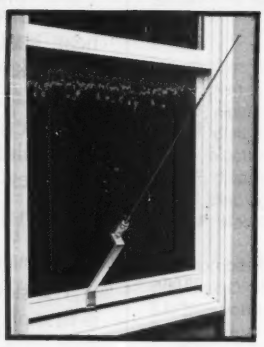

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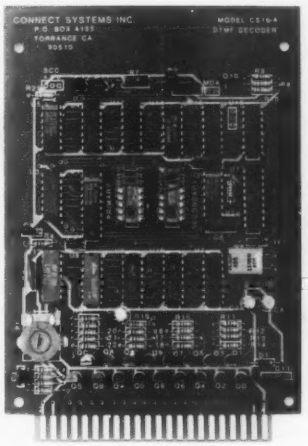

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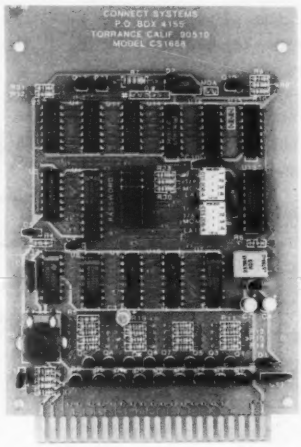

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It is unfortunate, however, that most technical literature on this antenna is outdated. Few amateurs today, for example, couple their balanced-line antennas inductively to the transmitter tank coil or use antenna-matching systems that require changing coils or coupling configurations when changing bands. In addition, many of the suppliers of open-wire feedline cited in past literature are no longer in business. Therefore, I have attempted to share in this article a modern design approach to the centerfed multiband antenna which I have gleaned from a review of literature, catalog inquiries, experimentation, and discussions with other amateurs.

Antenna Design and Characteristics

Traditionally, the centerfed multiband antenna is cut at 1/2 wavelength for the lowest desired band. Operation on all higher bands thus will be on multiples of 1/2 wavelength. For example, an antenna cut for 1/2 wavelength on 80 meters will appear as 1 wavelength on 40 meters, 2 wavelengths on 20 meters, 3 wavelengths on 15 meters, and 4 wavelengths on 10 meters. Cutting for 1/2 wavelength at the lowest operating frequency has become accepted practice because the voltage and current distribution, and hence the impedance and radiation patterns, are more easily predicted at multiples of a half wavelength. See Fig. 1 for construction practices and Fig. 2 for radiation pat-

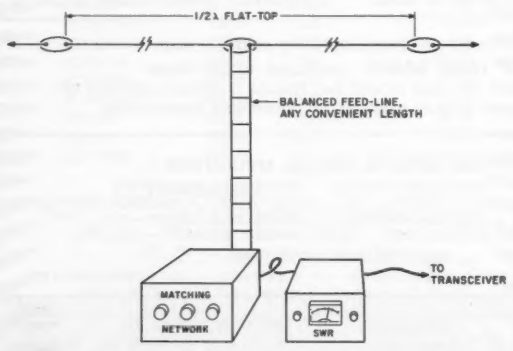

Fig. 1. Full-size version of the centerfed multiband antenna, cut for the lowest band of operation.

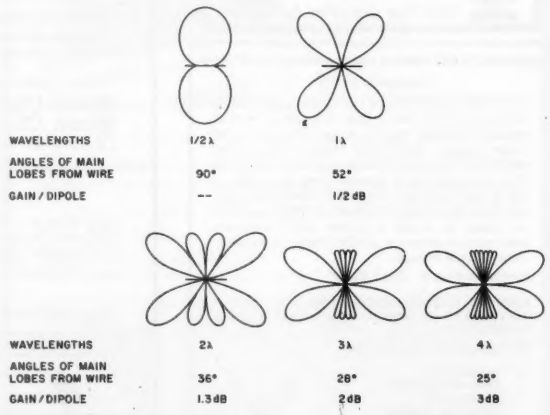

Fig. 2. Characteristics of the antenna.

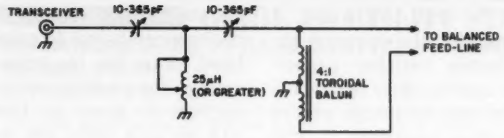

Fig. 3. A T-network with a 4:1 toroidal balun for use in coupling modern transceivers to balanced feedlines.

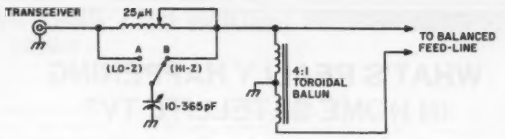

Fig. 4. An L-network coupler for use with balanced feeders.

terns and gain characteristics of this antenna for the 80-10-meter amateur bands.[1,2]

In limited-space situations where it is not feasible to erect a full 1/2-wavelength antenna, the antenna can be shortened and still be effective as long as the total length of half the antenna plus one feeder wire add up to at least 1/4 wavelength at the lowest frequency.[3] In the case of a shortened antenna, a field-strength meter can be used to obtain an approximation of the radiation pattern. The impedance, of course, need not be calculated as long as the antenna-coupling network presents a satisfactory (resistive) load to the transmitter.

Turning to the subject of balanced feedlines for this antenna, there are two popular alternatives. One is to use open-wire line, the other is to use plastic-jacketed twinlead cable. Open-wire line is just that—two parallel exposed wires held apart by ceramic or plastic spacers. It is available in 300- and 450-Ohm impedances.

Four current suppliers of open-wire line are: Radiokit, Box 411, Greenville, New Hampshire; Kilo-tec, Box 1001, Oak View, California; Madison Electronics, 1508 McKinney, Houston, Texas; and Texas Towers, 1108 Summit Avenue, Suite 4, Plano, Texas.[4] Plastic-jacketed television twinlead is readily available in almost all electronics stores and is generally acceptable for transmitters with outputs of 250 Watts or less. Belden makes a heavier-duty twinlead specifically for transmission purposes which is rated at 1 kW. Their product number for this twinlead is 8235.

The decision to employ open-wire line or twinlead should be made after considering the relative advantages and disadvantages of each. Open-wire line has the lowest loss but is less rugged and more difficult to support than twinlead. In addition, since the wires are not insulated, care should be taken not to route open-wire line where people could inadvertently come in contact with it. Twinlead, on the other hand, has greater loss, especially when wet. It is easier to route, however, as high-quality, TV-type standoffs can be used. Also, the heavy-duty twinlead is exceptionally rugged. (I have used the same heavy-duty twinlead at my Michigan QTH for ten years, where it has been exposed to ice, high winds, and low temperatures.)

The Antenna-Coupling Network

Prior to about 1970, most amateurs either coupled their transmitters to balanced lines through pi-network output stages and air-wound coil baluns or used various switchable series and parallel antenna-coupling networks. Today, with the advent of solid-state transceivers which require a nominal 50-Ohm resistive load for the antenna, an external antenna-coupling network is necessary to couple to 300- or 450-Ohm balanced lines.

The matching network almost universally used today is the T-match with a 4:1 toroidal balun. (It was largely the availability of the compact toroidal balun, which can easily be enclosed in the antenna-coupler chassis box, that led to the wide acceptance of this design by amateurs.) An experimental T-network coupler that I assembled from surplus parts is shown in Fig. 3.[5] Various modifications of this design are used in most kit or assembled "antenna tuners." (The term "antenna tuner" was not used in this article as it is actually a misnomer. A more accurate term for this device would be an "antenna-coupling network," since its primary purpose is to couple or match the line/antenna to the nominal 50-Ohm load requirements of the transceiver.)

To use the T-network coupler, first set both variable capacitors to a half-open position. Then, using low transmit power (5 or 10 Watts in the "tune" position), tap the inductor a winding at a time until a dip in swr is indicated. After the proper coil winding is tapped, alternately adjust the two capacitors for the lowest swr. If the swr is less than 1.5:1, apply full power to the coupler since the tuning process is now complete.

An Alternate Coupling Network

The reversible L-network, with the addition of a 4:1 toroidal balun, can also be used to match 300- or 450-Ohm balanced lines. The L-network requires only one variable capacitor, unlike the T-network which requires two. The trade-off in using the L-network over the T-network is that the Q of the L-network is less uniform over the coupling range. This presents little problem, however, if harmonic attenuation of the transmitter is sufficient. (Transmitters and transceivers marketed in 1979 or later generally have sufficient harmonic attenuation, as federal law mandated stricter emission and radiation standards about this time.) An experimental L-network that I built is shown in Fig. 4.

To use the L-network, select tap A for low impedances and tap B for high impedances. Next, select the coil tap that indicates minimum swr; then fine-tune the variable capacitor for the lowest swr. If the swr is less than 1.5:1, switch the transceiver from tune to full power since the tuning process is now complete.

Antenna-Coupler Construction Practices

For the amateur who has not constructed antenna-coupling units before, a few words about the subject are in order.

First of all, it might be helpful to know that complete information on winding toroidal baluns (along with a list of parts suppliers) can be found in almost any late edition of the ARRL handbook.[6] The appropriate section of the book will be listed in the index under "baluns."

To construct the air-wound coils required by the two antenna couplers, it is important to know the required coil radius, the coil length, and the number of coil turns for a given inductance. A formula to approximate the inductance of air-core coils is:

$$L = a^2n^2/(9a + 10b)$$

where L = inductance in microhenrys, a = coil radius in inches, b = coil length in inches, and n = number of turns.[7]

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the T- and L-networks, I found that the common air-dielectric variable capacitors used in older broadcast-band superhets work well in antenna couplers if the transmitter power output is less than 50 Watts. For higher-power transmitting applications, air variables with wider plate spacings are needed. These transmitter-type variables usually can be found at hamfests or can be purchased from larger amateur-radio supply houses.

A formula that can be used to calculate the capacitance of an unknown variable capacitor is:

$C = .224KA/d \times (n-1)$

where C = capacitance in pF, K = dielectric constant of material between plates (use 1.0 for air), A = area of one side of one plate in square inches, d = separation of plate surfaces in inches, and n = number of plates.[7]

Breakdown ratings for common air-gap variable capacitors can be easily calculated, since the breakdown voltage for air-dielectric capacitors is given as from 19.8 to 22.8 volts per mil (.001 inch).[8] This information is obviously useful when tube-type linears are used ahead of the antenna tuner. ■

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7. *Ibid.*, p. 26.
8. *Ibid.*, p. 24.

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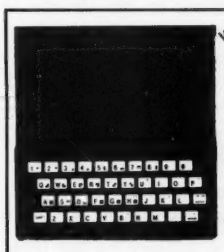

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Is your HW-101's offset off? Try this four-dollar fix. Without it, you're being cheated out of QSOs.

The original HW-100 transceiver (Photo A) and its cousin, the HW-101, both use a 1-kHz "transmit offset" for CW operation. This of course means that you will transmit on the same frequency (zero beat) as the CW station you are receiving only if you tune the transceiver so as to hear the incoming station with a 1-kHz audio CW note or "offset," as shown in Fig. 1. However, CW operation is generally carried on with a receiver bandpass of 750 Hz or less, which is one of the reasons you can enjoy less QRM and QRN on CW than on SSB.

However, if you tune your receiver so as to hear a tone of less than 1 kHz, you may transmit outside the receiver bandpass of most stations that you call, since you will be transmitting 1 kHz above where you are listening. Thus, if you add an external audio CW filter to your transceiver so that you listen to incoming CW signals at approximately 500 Hz, then with a 1-kHz offset you will transmit 500 Hz higher in frequency than the station you are receiving, as shown in Fig. 2. If this station is also using a 1-kHz offset, he will be trying to receive you at 1.5 kHz, which may be far outside his audio bandpass if he is using a 750-Hz bandpass CW filter for receiving. The result will be very few QSOs!

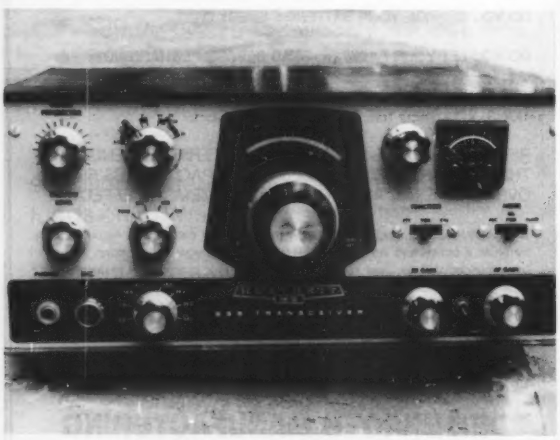

Photo A. The HW-100 with added Swan dial and audio-response control on the upper right. The small toggle switch on the lower right controls an external antenna relay.

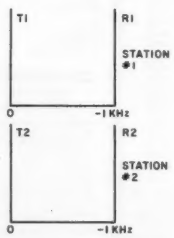

Fig. 1. Two CW stations both using a 1-kHz transmit offset with transmitters T1 and T2 zero beat in frequency. There is no difficulty in communication unless one station reduces his received bandwidth to less than 1 kHz using an audio CW filter.

Reducing the Transmit Offset

The solution to this prob-

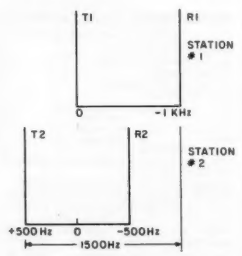

Fig. 2. Two CW stations, both using a 1-kHz transmit offset but with station #2 listening to a 500-Hz tone which places his transmit frequency so that station #1 must listen to a 1500-Hz tone. If station #1 is using a 750-Hz bandpass audio filter, he may not hear station #2.

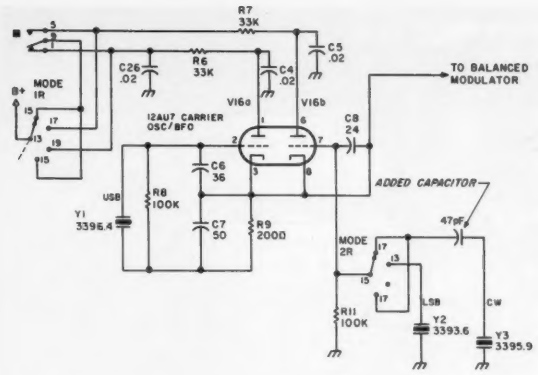

Fig. 3. Carrier-oscillator schematic illustrating added 47-pF capacitor.

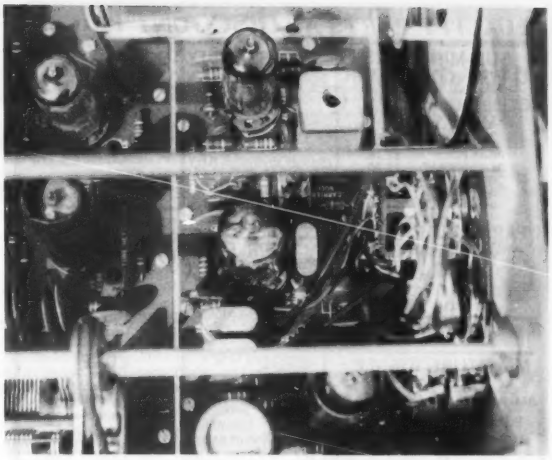

Photo B. The location of the 47-pF capacitor between point "22" on the circuit board near Y3 and the Mode switch.

lem is to change the CW transmit offset from 1 kHz to 500 Hz. I did this very cheaply and easily by inserting a 47-pF capacitor (Radio Shack #272-121) between the front-panel Mode switch and CW transmit crystal Y3 on the modulator circuit board next to V16, as shown in Photo B. I did this by removing the wire to Y3 from the Mode switch and by soldering one lead of the 47-pF capacitor to the Mode switch where the wire to Y3 was formerly located, using a short spaghetti-covered lead. I then soldered the wire from Y3 to the other shortened lead of the capacitor and covered the joint with spaghetti. Fig. 3 illustrates the circuit change schematically.

What I did with this modification was to retune Y3 upward 500 Hz, from 3395.4 kHz to 3395.9 kHz. The transmit offset is the difference between the frequency of USB crystal Y1 used for receiving on CW at 3396.4 kHz and the frequency of Y3 which is now 3395.9 kHz, or 500 Hz. After this simple modification, I had much better luck raising another CW station. Also, I could now go ahead and use a 750-Hz audio bandpass filter for improved CW reception without any problem.

Additional Modification

An additional modification that I made was to change the frequency of the 1-kHz tone oscillator used for CW monitoring and VOX keying to 500 Hz. This modification is a little more difficult. I had to remove the PEC (printed electronic circuit) board (Heath #84-22) on the audio circuit board near V15 and replace it with a homemade PEC. I obtained a printed-circuit experimenters' board (Radio Shack #276-158) and cut a piece of it to the same size as the original PEC. I also obtained five 0.001-uF capacitors (Radio Shack #272-126) and four 470,000-Ohm, ¼-Watt resistors (Radio Shack #271-1354). I mounted them as shown in Fig. 4 on the small board, being careful to locate the three pigtails in the same location as the old PEC pigtails. I then replaced the old PEC with the new one shown in Photo C. Note that V15 is removed so you can see the board clearly.

What I did with this modification, shown schematically in Fig. 5, was to retune the frequency of the audio phase-shift oscillator, V15A, from 1 kHz to approximately 500 Hz so that now when I transmit on CW, the monitor tone I hear is at approximately the same frequency as the CW station I am listening to. This helps me to make sure that I am transmitting at the correct frequency, so I can be zero beat with the received CW signal.

Results

The total cost of these two modifications was approximately $3.90, excluding sales tax. The CW operating benefit, as far as answers to my calls, has been greater than adding a kW

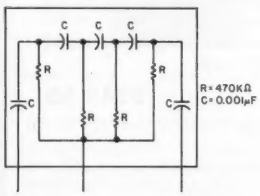

Fig. 4. Homemade PEC.

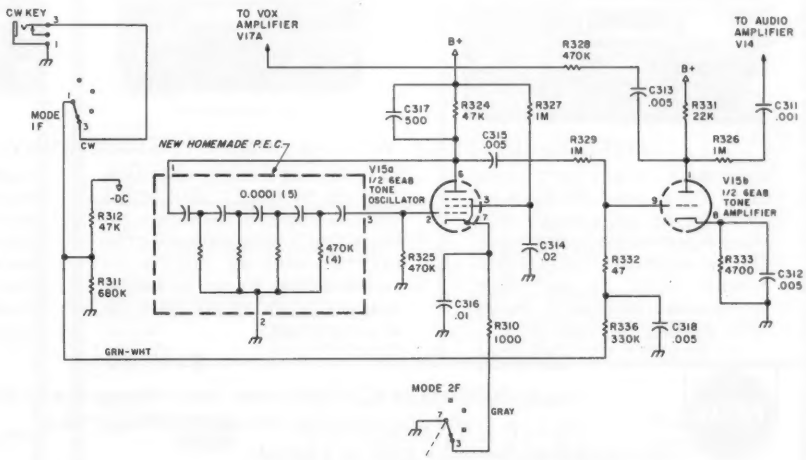

Fig. 5. Tone-oscillator schematic illustrating new homemade PEC.

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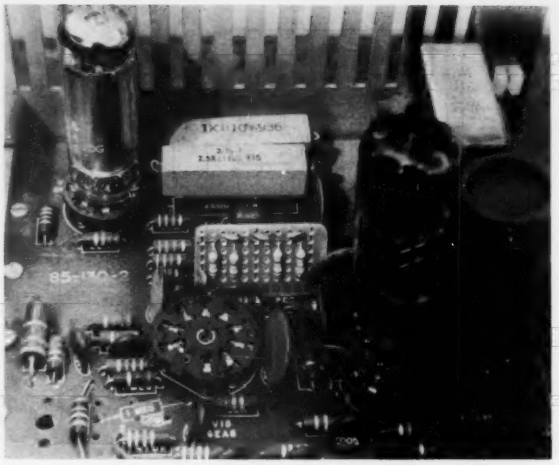

Photo C. The location of the homemade PEC board behind the socket for V15 (V15 being removed).

linear to the transceiver—which would have cost much more than $3.90!

A modification to the audio response of the HW-100 that I made several years ago that is also applicable to the HW-101 is described in an article entitled "Variable A.F. Bandwidth for the HW-100," in the June, 1970, issue of CQ. The knob on the upper-right portion of the front panel to the left of the meter, as seen in Photo A, is part of this modification. I will accommodate anyone desiring a copy of this article upon receipt of an SASE.■

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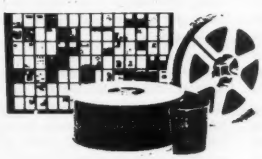

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LETTERS

RIG HR IS...

Just thought I'd drop you a line and let you know I thought your December editorial was right on target. I spend quite a few enjoyable hours every week SW DXing and, while I'm not a ham, I do read *73* from time to time and enjoy your editorials and some of the articles that can be applied to the SWL.

The most important reason I've never felt the urge to get into amateur radio is precisely because of what I hear on the ham bands (or rather I should say because of what I *don't* hear). I hear a lot of nice folks doing a lot of talking, but hardly any of them have anything at all to say! I would say 90% or better of what I've heard has been solely about equipment, equipment, and more equipment.

Wayne, this might come as a surprise to a lot of hams out there, but amateur radio is about *expanding* communication. It's not an end in itself. I'd certainly defend their right to yak about their equipment until the cows come home, but I can't see spending a lot of money and time on ham stuff, knowing there won't be any interesting people to talk to.

Wm. Burke
Richmond VA

NO ENCOURAGEMENT

It was with more than a little interest that I read "Never Say Die" in the November, 1984, issue, and I feel compelled to offer my two cents worth.

I received my Novice license after first seeing a flyer advertising ham radio and then attending a Novice class sponsored by the local radio club. I enjoyed the classes and had little difficulty with CW (unlike some others). I guess it was exasperating to most: "I'm going to toss that key as far as I can as soon as I upgrade" was often heard.

The fact that I have grown to like CW and think it's great is not the reason for this letter, though. I don't really know if the hobby would gain or lose with no-code licensing. What prompted me to write was reading that amateur radio seems to be having a hard time attracting newcomers. This doesn't surprise me in the least. If it were not for my own strong interest in radio and electronics, I would have dropped out of hamming months ago. The reason?

After I acquired my Novice license, I began attending the meetings at the local radio club. I even paid the $10.00 membership dues; I was eager to learn about my newly-acquired hobby and eager to get on the air. Financial limitations necessitated acquisition of my equipment piecemeal.

I quickly learned that: (1) Anyone inquiring about a *receiver* was odd, at best; (2) anyone expressing a desire to build his own equipment was probably a bit addled; (3) definitely don't remain a Novice any longer than necessary—maybe two or three weeks.

As time went on, I acquired enough equipment to get on the air and did so. At this point it wasn't easy, but I read a lot, and with plenty of anecdotes and television parts from Doyle W0SOM, I built what I needed (antenna, T/R switch, power supply, etc.) and got a reliable rig going on 40 meters (so far, I've worked thirty-six states).

I do not regret for a moment the fact that I received no encouragement or support from my local radio club, as I have learned a great deal, mostly the hard way. I do, however, feel a lack in my amateur experience, which brings me, now, to the point of my letter. New hams need all the help and encouragement they can get. Without it, it can be rough going at times (as probably most any ham can tell you), and if the clubs have the kind of attitude I encountered, they'll need a pretty strong motivation to stay in the hobby instead of just chucking it in disgust.

I do wonder if my experience is unique, and I hope it is, because otherwise amateur radio has problems.

Jon Danford KA0SOV
Joplin MO

PR GAMBIT

The convincing reason to learn, know, and use International Morse code is to defeat the language barrier in the international hobby/service of amateur radio.

It is one of the few ways you can communicate with the average Japanese technician. There must surely be others who have been to Japan and carried on an eyeball QSO almost entirely in Q signals because of the language barrier.

Electronics in Japan is not as rosy a picture as you have been painting for the past several months in the pages of *73*.

I became well acquainted with a technical school teacher and ham during my tour there, 1960–1964. The Senior Class of 1962 had about 25 young men in the electronics courses and nearly all were hams. Only one of these 25 is working in electronics, and he is with the local telephone company, in the microwave section.

I was a judge in their science fair. I talked to nearly all of the young men at least once a week. A recent visit, however, finds one of the "highly qualified" technicians operating a nearly bankrupt franchise camera shop. Another highly qualified technician worked for the Voice of America for a few years and now operates a coffee shop where coffee is $2.00 a cup. Another is selling real estate. These smart guys of the 60s that were heavily into electronics are no longer in the field in 1984.

My occupation allows one to meet current Japanese technicians who are in the US on temporary duty. I have yet to meet any 1984 technician who is a ham. I have yet to meet any who are graduates of a technical high school similar to the one I was acquainted with in the 60s.

I think what the Japanese have is a public relations gambit. There are many imposters out there in JA-land. Perhaps you have been taken in, Wayne.

As for Japanese research and development, they are not doing it. I have corresponded at great length about developing robotics (electronics), some in breakthrough areas, but there are no takers in JA-land, with the excuse similar to that in USA—no development money. That is, I have been willing to give away the basic ideas and provide testing and other resources free, but still no takers.

As for amateur radio in Japan, I have the September issue of *CQ Ham Radio*, all 537 pages of it. It is almost entirely advertising. There is less than 100 pages of ARRL-type station news. Technical stuff is pretty slim, maybe 12 pages. Is that a good deal for amateur radio? I think not.

This letter does, however, reflect my nature with regard to amateur radio; that is, I am arrogant, cynical, and skeptical.

Frank Jerome W5AT
Midwest City OK

CW ONLY

I am a Novice license holder and a subscriber to *73*. I enjoy reading it cover to cover and enjoy your editorials. In the December, 1984, issue, I believe you stated that the FCC has washed its hands of policing the ham bands. If this is so, please let me and the rest of the Novice license holders know who to turn to for help in cleaning up the 15- and 40-meter Novice bands that are supposed to be used for CW only.

On Wednesday, November 11, 1984, I was sending CQ on 21.146 MHz when I was drowned out at 7:20 am by ZF2BD in contact with KA9KDS using voice. This is the middle of the Novice (CW only) band. I don't have a *Callbook*, so I don't know where they are located. Before they signed off, they made plans to make contact again on 40 meters at 7.125 MHz.

It seems to me that these two amateur CB operators have much more of the amateur bands to use voice on than the Novices have for CW. I, for one, would like to see the Novice or CW bands used for CW only, as this is the way they were intended to be used.

I hope this letter will help to clean up the misuse of the Novice or CW bands and remind the higher class license holders to use the bands properly.

J. R. Russell KA0FCM
Lockwood MO

Alas, one can't be sure who is wearing the CB shoes these days! In the case of your QRM from ZF2BD on voice, if you will check the international ham frequency allocations, you'll find that this chap had every right to be using voice on that frequency—Cayman Islands are not part of the US, so they don't have to use American subbands. If KA9KDS was also on voice on the channel—well, that's not legal. But I'll bet KDS was safely up in the American phone band, working cross-frequency to the ZF2.—Wayne.

CONCEDE OR DESTRUCT

Regarding Wayne Green's last two editorials in the November and December issues of *73*, I would like to present these sentiments on behalf of all the concerned amateurs standing just outside the circle of fury and frenzy generated by the code/no-code confrontation relative to amateur-radio licensing. It's bad enough that they must accept the inevitability of losing certain frequencies to the future demands of commercial requirements, but there is also the matter of pride that was once so great, now being demeaned by the influences and the attitudes inside and outside their ranks. Influences and attitudes that run the gamut of human frailty from apathy to willfulness.

Despite allegations to the contrary, there are thousands of amateurs who still want it remembered that their hobby is more than "a small group of aging men..." or "entertainment for a few technical nuts...", that their pursuit is an avocation that accommodates the communicator and the experimenter, gives hope to the disabled and the confined, serves the public in times of special events and local disasters, plays an important and vital part in the defensive posture and economic structure of our nation and could, if a nuclear holocaust engulfed the world, provide the only link to a sane survival through the innovativeness and creativeness of the experienced amateur.

And they believe that, with firm, constructive ledership, the winds of "fury and frenzy" can be calmed, the bickering of "tired old men" can be quieted, the aid of the general public can be enlisted to help increase interest in amateur radio, and finally, the attitude of the FCC might even be changed. But none of this can be accomplished unless all concerned amateurs recongnize that the cure for our ills is not to compound the blame with more denigration, but only through a renewed spirit of cooperation and compromise.

And I would plead with every individual concerned with the protection of our beloved fraternity, whether or not he concedes that his operating habits make him suspect for indictment, that he rationalize his feelings, measure his sensibilities, and concede that we are in deep trouble.

We have discussed the extent of amateur radio being over and above a simple hobby. What about enhancing the name and the image to Amateur Radio Services?

We have discussed firm and constructive leadership. If we can't have a separate Commissioner of Amateur Radio Services, what about campaigning for Senator Barry Goldwater as a future member of the FCC upon retirement from the Senate?

We have discussed public help in increasing interest in amateur radio. Have the Boy Scouts of America been queried on the possibility of establishing super merit badges earned by the acquisition of various grades of amateur licenses as extensions of their present merit badge obtained for learning the Morse code?

Have colleges been queried on the idea of establishing scholarships for technical merit based on a degree of excellence acquired through a combination of amateur-radio experiences, grade of license, and value of public service?

Last, but not least, I am not completely convinced that no-code licensing would increase interest in amateur radio, especially on 220 MHz. And I am just as concerned that there are other factors besides no-code licensing that encourage amateur-radio participation in Japan. Therefore, I propose a change in amateur-radio operating regulations that I believe would greatly stimulate interest in amateur radio. It would certainly open the door. In fact, its potential for national service beyond helping amateur radio is only limited by its degree of expansion. And take note "tired old men...", we could be talking about the security, welfare, and future of our grandkids.

In essence, the proposal would permit certain qualified amateurs and certain Special Privileged licensees to communicate solely with each other on prescribed frequencies; all units owned, maintained, and controlled by the qualified amateur would be operated under his direct or indirect supervision and responsibility in accordance with FCC regulations. The Special Privilege License would require passing an examination on FCC regulations and some knob-twisting questions on the level of those taken in auto driving tests.

Revolutionary as this concept may be, I would not be surprised that for every negative response we might find ten positives by the objective thinkers. Let's see what

the readers say. Here is some food for thought:

1) No additional QRM.

2) Every household with a qualified amateur could automatically extend the blanket of family security and welfare. Amateur ingenuity and application would be a manufacturer's delight.

3) Immediately interest in amateur radio would be increased. Properly supported and publicized, it could be like honey to the fly.

4) Operating procedures are dictated by the FCC. Amateur radio sorely needs more operating ethics. Women participants could provide more of that in proportion to the degree that we encourage their participation. And let's admit it, technical exams are also a roadblock to the mother and the housewife. Why not whet her appetite and see what happens after that. How come just answering a few simple questions gets a driver's license to drive a lethal machine instead of questions on automotive engineering or first aid?

5) Boy Scout leaders in their patrols and high school teachers in their radio clubs could greatly stimulate participation in communications through actual example.

6) For the antenna experimenter, a field strength meter, a Privileged assistant, and an HT would be paradise.

7) For the FEMA, a giant step towards ultimate national emergency communications. Possibly some sort of a tie-in with police facilities could eventually be developed through scanners, etc.

Well, that's it and if it's heresy, then let it be. Much water has passed over the dam since the days of my first spark coil. The fascination and excitement of those pioneer days are gone. But for us "tired old men...", the nostalgia still remains. Shouldn't each new generation have the same right to this same opportunity, too?

Wherever there is controversy and turmoil, there must be a cause. For those who will look beyond the horizon of this cause, they will find the hope of cooperation and compromise. For the skeptic there is only the bottom line, Concede Or Destruct.

Larry Amann K5TQN
Holiday FL

COAX CONNECTIONS

I thoroughly enjoyed Fred Cook's article, "The End of the Line," in your November, 1984, issue. Proper PL-259 coaxial connector installation is something that most amateurs, I believe, have misunderstood. Having installed and repaired literally hundreds of mobile telephones, two-way radios, and repeaters has really helped me appreciate this science.

Here are some additional suggestions that I find helpful and hopefully will aid those who find this task still a bit difficult.

- Unless you use silver-plated connectors, soldering to the four shield holes can be quite difficult. Scraping the inside of these holes with a small knife or reamer roughens the plating for better solder adhesion.
- It is advisable to screw at least 3/8" of the barrel over the outer insulation, providing superior mechanical strength.
- I would suggest checking the connector for shorts before *and* after soldering the connector.
- When soldering the shield, I lay solder over the hole and place an already heated 550-Watt soldering gun tip to the top of the solder. The solder flux runs into the hole, cleaning things up, and the hot gun quickly heats the materials. Usually a 550-Watt gun will heat the connection in about a second. The quicker you can heat the connection and remove the gun, the less chance you have to melt the center insulation. It is amazing how many "professionally installed" connectors I have replaced that have melted insulation due to too much heat from soldering the shield.
- Bravo to the layered Scotch brand tape and Scotchkote! There are no finer connector-weatherizing materials. Do *not* use cheap tape. It is miserable climbing a 100-foot tower in a Michigan snowstorm to repair a wet coaxial connector.

Please continue publishing these invaluable "basic" articles. They are always needed.

Dean A. Alger WD8ONL
Grandville MI

I HATE CODE

First, let me say that I am not even a ham yet. I went to take the test (Novice) from a VEC at the Chattanooga Hamfest and didn't pass it because of the code. But I do know enough about electronics to be at least General class. I took it in high school and got all A's.

The reason I didn't pass the code test is I hate code. It is awkward and stupid to use. Now, don't get me wrong—I am not just crying because I didn't pass, but I know that code is not more reliable than voice or digital.

I am now a CBer. I know that hams look down on CBers as being uncivilized and ignorant with the use of the bands, but have you listened to some of the ham bands lately?

Two meters around here seems like CB because of the way some of the hams hog the band. But that is like anything else—there are good and bad hams and CBers.

When I failed the test, by the way, a ham friend of mine told me that most amateurs don't want any more hams because of the QRM it would create on the bands. I can see that point, but what happens when all of the old hams die? Trouble, huh!

Since I have been in CB (about 11 years) I have almost always obeyed every rule (I still use my call letters because I like to), but I have seen a drop in CBers in the last few years.

Since the FCC dropped the license on CB, there has been a drop in popularity because anyone can do it now. The CBers I know all use linears, overmodulate, and use unallotted channels to keep any interest in the hobby. (I don't do those things.) I think a hobby should be fun and challenging, not a pain in the rear like the code.

If the FCC drops the code, in my opinion, it will go like CB. A lot of people would lose interest in it and leave it for the dedicated ones—like the CBers who are left (the illegal ones).

I will take the test again and again until I pass it. I just hope that there is a hobby for me to get into by the time I pass the code test.

Keep up the good work—you run a great mag. I read it all the way through every month.

Thanks for all of your dedication. I hope to talk to you sometime maybe on 20 meters, if you aren't dead of old age by the time I get my General.

Rick C. Wilson
Chattanooga TN

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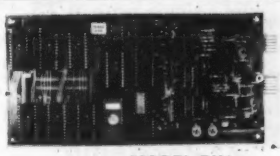

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BE MY GUEST

Guest Editorial by Perry Donham KW1O

STOP PLAYING AROUND

I had a really nice chat with Sanpio XZ5A the other day. It went something like this: "R TU 5NN NH 73." And now I have some new pasteboard on the wall of the shack.

Even as I was sending the exchange, I felt a flush of anger and resentment. I resented the fact that there was no way on Earth I could have a casual conversation with this fellow, and I was angry at myself for playing the DX game. Playing so hard, in fact, that I felt it would be a cardinal sin to ask Sanpio any question at all regarding the shack, or the weather, or any pets he might have. You know the feeling. And even if I could have overcome the guilt of establishing a conversation, I can't imagine a few hundred greedy DXers standing by on frequency while we chatted. That's not playing the game.

What is the force behind DXing? What drives otherwise normal hams to screaming obscenities and using "a little extra" power? Something is very wrong with amateur radio if all we can say of ourselves is, "Oh, I've worked 304 countries" when asked what we do with our hobby. It's time that we stop destroying ham radio and take a close look at the image we project to the world outside.

Here's the key: Let's do away with DXing. Let's get rid of all the silly pins and certificates and Honor Roll listings. I can see some really positive things coming out of such a plan.

First, there would be a drastic reduction in the amount of stations on the air at any given time, with an attendant increase in the rate of information exchange. This is because we would with one blow eliminate thousands of hams who can't carry a conversation beyond the "5NN NH QSL SURE" stage. These people would just wander back to the TV and switch on "Family Feud."

Second, an enormous quantity of rare DX would appear on the bands, since they wouldn't be hounded off the air by 3-kW stations demanding to be acknowledged. They would be shy and elusive at first, remembering past hurts, but soon they would realize that the true communicators left really were interested in their lives. As it is now, these fellows get so disgusted with the continual pileups that they just leave the air and take up philately. But what they *really* want is someone to talk to.

Finally, we would do away with all the bickering and hatred involved in hard-core DXing. I think sometimes we forget that amateur radio is more than a hobby—it's a *service*, unlike photography or riding horseback. Working DX is just one tiny part of the hobby, but it seems to be a breeding ground for greed and ill will.

Here are three steps that we can take right now. We've got to do *something*, or we might as well all pitch our rigs into the dumpster:

- Eliminate the DXCC Honor Roll. The basic DXCC award should be retained—it's still an accomplishment to work 100 countries. And we'll maintain some sort of shrine for those who've already received their HR stickers.
- Require the QSL cards for any DX award to document that a conversation of not less than ten minutes took place. The "5NN NH" folks will just have to send r-e-a-l slow.
- Create a special category of awards specifically for the contest-style DXer in which the contacts can *only* be made during a contest or DXpedition.

Some of these suggestions may be impractical, but I think you can get the point. We simply must inject a little more idle chit-chat into ham radio.

Ham-Day '85

Now that your circulation is going, I want to remind you about Ham-Day '85. H-Day is March 24th, and it's the day that every ham in the United States is going to invite one person into his or her shack for a live demonstration of amateur radio. H-Day is a very simple way to get a whole passel of people interested in our hobby. The idea is *not* to teach your guest(s) radio theory or (heaven forbid!) Morse code, but just to give them a little taste of the fun that can be had on the bands. You could even let them take the mike for a while. A *really* sneaky thing to do would be to find out (secretly, of course) some part of the country where your guest has friends or family, then set up a schedule to that location!

The thing to remember is this: We hams have a whopping good time, and it shows. All you have to do is get someone into your shack for one hour, make a few contacts, and BINGO—a seed is planted. Don't worry if the person doesn't immediately sign up for a Novice class. Someday, maybe ten years from now, they will think back on that time spent in your shack and the seed will start to grow. Don't you remember how *you* became interested?

Perry Donham KW1O is 73's Technical/International Editor.

W2NSD/1
NEVER SAY DIE

editorial by Wayne Green

from page 4

itors. Give 'em a taste of what it's like.

Clubs—please make a club project out of this. Organize visitors to club-member ham shacks or even set up demonstration stations in malls, but set them up so the visitors will be able to talk over the stations and others around will be able to hear what is going on.

March 24th is D-Day—ham Demonstration Day. Let's get every ham we can on every band to demonstrate amateur radio and to talk with visitors to ham shacks.

CES

The Winter Consumer Electronics Show in Las Vegas drew nearly 100,000 attendees again—mostly hi-fi and electronics dealers from all over the country. And again virtually all of the products were from Asia. The new and exciting products, almost without exception, were from Japan. The biggest hits of the show were the new compact discs and players. They were the fad of this season—just as low-end computers were the fad a year ago, video games the year before, and hand-held electronic games the year before.

Someone asked me why there were virtually no Ameri-

can-made products at the show. I explained that Japan has left our country in the dust in electronics. They're graduating more engineers than we are and their best and brightest are going into creating new consumer electronics products. Engineers we've developed in the US—and the number hasn't grown in over twenty years despite the incredible growth in electronics—are going into military electronics, where the unlimited money is. Japan has no military projects, so their top people are working on consumer electronics.

So I wandered around the show looking over the latest stuff from Hitachi, Mitsubishi, Panasonic, Toshiba, Casio, Seiko, Epson, NEC, Sansui, Nakamichi, Kyocera, Quasar, JVC, Sony, and so on. The good old American brands such as RCA and GE were Japanese-made, too.

The way to change this, if it isn't already too late, is to get kids interested in hamming so they'll be attracted to high-tech careers later on. In that way we'll eventually have some engineers, technicians, and scientists. You can bet that there isn't a single kid in Japan who isn't familiar with amateur radio. Every high school has a ham club—many with hundreds of members. Perhaps we can get started with D-Day—ham Demonstration Day—and begin to get the word out.

We have about 100,000 hams in America who are reasonably active—who have stations which might help demonstrate our hobby. If every active ham were to show just five friends and neighbors how amateur radio works, we'd have a half million Americans acquainted with our hobby. That's a start.

Japan, with over a half million active hams and nearly 1.4 million licenses issued, will still be way ahead of us—and with only half our population! But if this idea works, perhaps we can gear up and do this two or three times a year and gradually get the word around. It sure would be nice if every American had an understanding of our hobby and realized that he/she could join in the fun if he/she wanted.

For those hams who haven't read the rules, there are certain restrictions against visitors talking over your station. A friend can talk to hams in any country that the US has a third-party agreement with.

I'll be on twenty looking to talk with your visitors on D-Day, so look for me.

Writing about CES, my main reason for getting to the show involved my new *Digital Audio* magazine—about the compact discs. I've managed again to be in the right place at the right time with a new magazine—just as I was with *Byte* when the microcomputer revolution got started. Our address is WGE Center, Peterborough NH 03458.

Digital Audio is particular fun for me because I've been a hi-fi hobbyist for almost as long as I've been into hamming. And back in the early 50s, when LPs and hi-fi really got started, I was a major manufacturer of speaker enclosures. Larry LeKashman, who'd been an editor of *CQ* before me, was the driving force at Electro-Voice. The electronics industry was smaller then, with radio and audio as its main components.

But in addition to the excitement of compact discs for listening—and by the way, once you hear one you'll have a terrible time not buying a player—their potential for computer applications is awesome. One 4-3/4" disc can hold around 600 megabytes of data. That's about 300,000 pages. Indeed, about twenty of these discs could hold the name, address, and phone number of every person in the world with a phone.

What few hams we have left in our hobby seemed to be at CES and many of them stopped by the *Digital Audio* booth to say hello. My thanks!

Okay, so where do compact discs fit into amateur radio? It's really too early to tell yet, but one good possibility might be to combine sound and pictures on a disc and thus be able to have everything needed to teach our license classes on a single disc. Several firms are already mixing pictures with sound and/or data on these laser discs.

A world *Callbook* on disc would be duck soup, making it possible for us to search for anyone by name, call, location, and possibly other parameters such as special interests like satellite communications, packet radio, repeaters, RTTY, and so on. An index to every ham article ever published along with reprints of everything published in the last few years might take a couple discs.

DAYTON

Since amateur radio has gone from bad to worse in the last year—as I predicted, unfortunately—I'd decided it might be best if I skipped haranguing everyone at Dayton again this year. The role of being the bearer of bad news isn't my forte. I much prefer to be upbeat. If I do have bad news, I at least want to have some good positive suggestions for solving the problems. But I honestly don't see any real salvation for our hobby—unless this D-Day concept takes hold and we start getting newcomers interested. So, lacking any positive ideas, I decided that the need for another nagging session wasn't there, so I should skip my yearly talk.

Jack Burnett suggested that, well, if I didn't want to talk about amateur radio, perhaps I would just talk about what Wayne Green is doing these days. I don't know why that would be of interest, but I'm game—so I agreed. I'll bring some slides so you can see the new WGE headquarters, the Green Publishing Institute, the new magazines I've started, and so on. No one will come, I know.

After being one of the more unknown people in the world—at least outside of amateur radio—I've been enjoying the recent publicity I've gotten. The February issue of *Folio*, the publishing magazine, had a nice article on me. And the February issue of *Venture* likewise. *Venture* is a great magazine, by the way, and I'd say that even if they didn't do a Wayne Green article. There are some more in the works and who knows, all this PR may eventually convince one of the consumer magazines to do a bit on me.

So, get your station cranked up for D-Day—and look for me at Dayton, okay?

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SPECIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Peterborough NH 03458.

MILWAUKEE WI
MAR 2

The Milwaukee School of Engineering ARC will sponsor its second annual swapfest on Saturday, March 2, 1985, beginning at 8:00 am, at the MSOE cafeteria, downtown Milwaukee. Admission is $2.00 and tables are $3.00. Setup is at 7:30 am. Food will be available. Talk-in on 146.19/.79 (W9HHX). For tickets or more information, send an 8½ × 11 SASE to MSOE ARC W9HHX, 1025 N. Milwaukee Street, Room C-6, Milwaukee WI 53201, or call Pete or Paul at (414)-347-1099.

CIRCLEVILLE OH
MAR 3

The Teays Amateur Radio Club will hold its seventh annual hamfest on March 3, 1985, beginning at 8:00 am, at the K. C. Lodge, two miles north of Circleville OH on County Road #51 (old #23). Sellers' setup begins at 6:00 am. Tables (8-foot) are $4.00 in advance and $5.00 at the door. Tickets are $2.00 in advance and $3.00 at the door. Talk-in on the Circleville repeater (147.18). Refreshments will be available. For table reservations, send an SASE to Joe Subich AD8I, 7825 State Route #188, Circleville OH 43113. For additional information, contact Len Campbell WB8PPH, 8951 State Route #188, Circleville OH 43113.

SPRINGFIELD MA
MAR 3

The Mount Tom Amateur Repeater Association, Inc. (MTARA) will host its first annual indoor flea market on March 3, 1985, from 9:00 am to 4:00 pm, at the Knights of Columbus Hall, Elder Council 69, Granby Road, Chicopee MA (easy access from I-90, I-91, and I-391). Admission is $1.00; tables are $7.00 in advance and $8.00 at the door. Power is available for vendors. Setup begins at 8:00 am. There will be food available. For table reservations or more information, contact Mickey Yale N1CDR, 6 Laurel Terrace, Westfield MA 01085; (413)-562-1027.

ST. LOUIS MO
MAR 8

The Jefferson Barracks Amateur Radio Club will hold its 25th annual Amateur Radio Auction on Friday, March 8, 1985, beginning at 7:30 pm, at the St. Louis Firefighters Hall, 5856 Gravois at Christy, South St. Louis City.

MORRIS PLAINS NJ
MAR 8

The Split Rock Amateur Radio Association will hold its annual ham auction on March 8, 1985, beginning at 8:00 pm (doors open at 7:00 pm), at VFW Post 3401, Tabor Road (Route 53), Morris Plains NJ. Free parking will be available. For more information, write to SARA, PO Box 3, Whippany NJ 07981, or check the K2RF repeater on 146.385/.985.

HUDSONVILLE MI
MAR 9

The Holland Amateur Radio Club will sponsor its second annual Amateur Radio Auction on Saturday, March 9, 1985, from 9:00 am to 1:00 pm, at the Hudsonville High School auditorium, 5051 32nd Ave., Hudsonville MI (6 miles north of I-196, Exit 62). Equipment can be checked in from 8:00 am to noon. A 10% donation will be received from each item sold. Talk-in on 146.06 and .52. For more information, contact Dan Ruiter KC8KN, 7106 Michael Drive, Hudsonville MI 49426.

LAFAYETTE LA
MAR 9–10

The Acadiana Amateur Radio Association will hold its 25th annual hamfest on March 9–10, 1985, in conjunction with the American Radio Relay League Louisiana State Convention, at the Holiday Inn Central Holidome, just south of Interstate 10 on Highway 167, Lafayette LA. For further information, contact the Acadiana Amateur Radio Association, PO Box 51174, Lafayette LA 70505.

INDIANAPOLIS IN
MAR 10

The Morgan County Repeater Association will sponsor the Indiana Hamfest (formerly the Martinsville Hamfest) on March 10, 1985, starting at 8:00 am, at the Indiana State Fairgrounds Pavilion Building, Indianapolis IN. Admission is $5.00. A premium table is $40.00, a flea-market table is $8.00, and a flea-market space without a table is $3.00. All tables must be reserved in advance. Setup for reserved tables will be available Saturday, March 9, from 3:00 pm to 9:00 pm. Setup on Sunday, March 10, is from 6:00 am to 8:00 am. No cars will be let inside after 8:00 on Sunday. There is free parking. Talk-in on 145.25. For table reservations or information, send an SASE before March 1 to Aileen Scales KC9YA, 3142 Market Place, Bloomington IN 47401; (812)-339-4446.

STERLING IL
MAR 10

The Sterling-Rock Falls Amateur Radio Society will hold its Silver Anniversary Hamfest on March 10, 1985, beginning at 7:30 am, at the Sterling High School Fieldhouse, 1608 4th Avenue, Sterling IL. Admission is $2.00 in advance and $3.00 at the door. There will be commercial distributors, dealers, and a large flea market. There will be free parking and space to accommodate self-contained campers overnight. Food will be available. Commercial tables and tables requiring electricity are $5.00; other tables are $3.00. Talk-in on 146.25/.85 (W9MEP). For tickets, table reservations, or information, contact Sue Peters KA9GNR, PO Box 521, Sterling IL 61081; (815)-625-9262.

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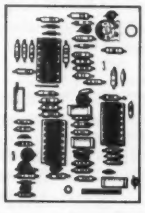

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BLACKSBURG VA
MAR 14–16

Virginia Polytechnic Institute and State University will hold a workshop, Personal Computer and STD Computer Interfacing for Scientific Instrument Automation, on March 14–16, 1985, at Virginia Tech, Blacksburg VA. The hands-on workshop, directed by Mr. David E. Larsen and Dr. Paul E. Field, is $450.00 for three days. Participants will be wiring and testing interfaces. For more information, write Dr. Linda Leffel, CEC, Virginia Tech, Blacksburg VA 24061, or phone (703)-961-4848.

NORTH AMERICAN OPEN SLED DOG RACE
MAR 15–17

During March, 1985, contacts with the Arctic Amateur Radio Club will be confirmed with special QSL cards picturing Fairbanks' three major winter events: the Yukon Quest sled dog race, the Winter Ice Festival, and the North American Open sled dog race. The AARC will also mount a 48-hour contest-style operation during the North American Open, from 0000 UTC on March 15 through 0000 UTC on March 17, on 80 meters through 70 cm, using the club callsign KL7KC. To qualify for an award certificate, submit a QSL from KL7KC dated March 15, 16, or 17, 1985, and cards from any two members of the AARC dated March, 1985 (or a list of contacts certified by an official radio club or two other amateurs). Endorsements for working 25 additional AARC members during March are available. Please send $5.00 (to cover the cost of certificate printing and handling) to: Arctic Amateur Radio Club, PO Box 81389, Fairbanks AK 99708.

HUDSON NH
MAR 16

The Interstate Repeater Society will hold its annual flea market on Saturday, March 16, 1985, at the Lions Club, Lions Avenue, Hudson NH. Talk-in on 146.25/.85 and 146.52 simplex. For complete information or to reserve a table, write the Interstate Repeater Society, PO Box 693, Derry NH 03038, or call Dick WB8YGR at (603)-889-3479.

FT. WALTON BEACH FL
MAR 16–17

The Playground Amateur Radio Club (PARC) will sponsor the fifteenth annual North Florida Swapfest on Saturday, March 16, 1985, from 8:00 am to 4:00 pm, and Sunday, March 17, 1985, from 8:00 am to 3:00 pm, at the Ft. Walton Beach Fairgrounds, Ft. Walton Beach FL. For further information, contact the Playground Amateur Radio Club, PO Box 3075, Ft. Walton Beach FL 32548.

MIDLAND TX
MAR 16–17

The Midland Amateur Radio Club will hold its annual St. Patrick's Swapfest on Saturday and Sunday, March 16–17, 1985, at the Midland County Exhibit Building, located east of Midland on the north side of Highway 80. The hours on Saturday are 10:00 am to 5:00 pm and on Sunday, 8:00 am to 2:30 pm. Registration is $5.00 in advance and $6.00 at the door. Tables are $6.00 each. Volunteer examiner tests for all categories will be given and refreshments will be available. For reservations and further information, please contact the Midland Amateur Radio Club, PO Box 4401, Midland TX 79704.

WEST HARTFORD CT
MAR 17

The Insurance City Repeater Club will hold its third annual ham-radio/electronics flea market on March 17, 1985, from 9:00 am to 4:00 pm, at the American School for the Deaf, North Main Street, West Hartford CT. Admission is $1.00 and tables are $8.00. For more information, contact Charles I. Motes, Jr. K1DFS, Treasurer, 22 Woodside Lane, Plainville CT 06062; (203)-747-6377.

CONEMAUGH VALLEY PA
MAR 17

The Conemaugh Valley Amateur Radio Club will hold its eighth annual hamfest on Sunday, March 17, 1985, from 8:00 am to 4:00 pm, at the East Taylor Fire Hall, on Route 271, five miles south of Route 22 (4 miles north of Johnstown PA). Food will be available. Talk-in on 146.34/.94. For more information, write to the Conemaugh Valley Amateur Radio Club, 2829 Bedford Street, Johnstown PA 15904.

TRENTON NJ
MAR 17

The Delaware Valley Radio Association will hold its 13th annual flea market of amateur-radio and computer equipment on March 17, 1985, from 8:00 am to 4:00 pm, at the New Jersey National Guard 112th Field Artillery Armory, Eggerts Crossing Road, Lawrence Township, Trenton NJ. Admission is $2.50 in advance and $3.00 at the door. There will be indoor and outdoor flea-market areas, commercial dealers, and plenty of refreshments. Sellers must provide their own tables. Talk-in on 146.52 and 146.07/.67. For advance tickets and space reservations, send an SASE to KB2ZY, Box 441B, RD #1, Stockton NJ 08559.

JEFFERSON WI
MAR 17

The Tri-County Amateur Radio Club will hold its annual hamfest on March 17, 1985, from 8:00 am to 3:00 pm, at the Jefferson County Fairgrounds, Jefferson WI. Tickets are $2.50 in advance and $3.00 at the door. Tables are $3.00 in advance and $4.00 at the door. There will be plenty of food and free parking. Doors open at 7:00 am for sellers only. Talk-in on 144.89/145.49, 146.22/146.82, 146.52/.52. For more information, advance tickets, or table reservation, send an SASE to Bob Barker K9RIJ, 724 Burdick, Milton WI 53563.

MAUMEE OH
MAR 17

The Toledo Mobile Radio Association, Inc., will hold its 30th annual Ham/Computer Fest and Auction on Sunday, March 17, 1985, from 8:00 am to 5:00 pm, at the Lucas County Recreation Center, Key Street, Maumee OH. Admission is $2.50 in advance and $3.00 at the door. Tables will be available. Alternate activities will be held in the 4-H room, starting at 11:00 am. Free parking and refreshments will be available. Talk-in on 146.52, 147.87/.27, and 447.850/442.850. For tickets or more information, contact Joseph Nyitray W8LNV, 3950 Drummond Road, Toledo OH 43613; (419)-472-7935.

CHINESE WATER GOD
MAR 23–24

The Yuba-Sutter ARC will operate WA6AGD from 1600 UTC on March 23 to 0400 UTC on March 24 to commemorate the 105th annual parade and festival in honor of BOK KAI, the Chinese Water God. WA6AGD will be using the low end of the General phone bands of 75, 40, and 20 meters and also 147.450 simplex. For a certificate suitable for framing, send a QSL and an SASE to WA6AGD, c/o BOK KAI, Marysville CA 95901.

H-DAY
MAR 24

Sunday, March 24, 1985, is H-Day: 73's attempt to help attract more people into amateur radio. We want YOU to PERSONALLY invite someone to watch you operate. Share ham radio for only one hour with ANYONE who you think might be interested. Stop worrying about ham radio's future—do something about it. ARS W2NSD/1 will be on the air most of the day and KW1O will have dragged some unsuspecting passer-by into the shack. Help us help you—on H-Day.

GROSSE POINTE MI
MAR 24

The Southeastern Michigan ARA (SEMARA) will sponsor its annual Swap and Shop on March 24, 1985, from 8:00 am to 3:00 pm, at Grosse Pointe North High School, 707 Vernier Rd., Grosse Pointe MI. Admission is $3.00 and tables are $8.00. Talk-in on 147.150 repeater and 146.52. To reserve tables, call George Berg KB8SS at (313)-446-1804, or write to PO Box 646, St. Clair Shores MI 48080.

LYNN MA
MAR 24

THE 19/79 ARA of Chelsea MA will hold its annual flea market on Sunday, March 24, 1985, from 11:00 am to 3:00 pm, at the Ireson building in Ryan Hall (part of the Lynn Hospital complex), 493 Western Avenue (Route 107), Lynn MA. Admission is $1.00 and tables are $6.00 in advance and $8.00 at the door. Talk-in on 146.19/.79 and 146.52. For table reservations, send checks to 17/79, PO Box 171, Chelsea MA 02150.

WINCHESTER IN
MAR 24

The Randolf Amateur Radio Association will hold its 6th hamfest on Sunday, March 24, 1985, from 8:00 am to 5:00 pm, in the Winchester National Guard Armory. Ticket donations are $3.00 and children under 12 will be admitted free. Table space (by reservation only) is $5.00 with a table and $2.50 without. On Saturday, setup is from 6:00 pm to 8:00 pm and on Sunday, 6:00 am to 8:00 am. Features will include dealers, a flea market, programs, food, and drinks (all inside). Talk-in on 147.90/.30 and 224.90/223.30. For reservations and more information, contact RARA, Box 162, Winchester IN 47394, or call Herb James WB9UZZ at (317)-584-4995.

FARGO ND
MAR 30

The Red River Valley and NDSU Amateur Radio Clubs will sponsor a ham-radio/computer show and swapmeet on March 30, 1985, from 8:00 am to 5:00 pm, at the Army National Guard Armory at Hector Field. Commercial tables are $20.00 and noncommercial tables are $5.00 ($3.00 for a half table). Talk-in on 146.16/.76. For table reservations or more information, contact Tim Gooding WD0GUR, Event Chairman, 1006 Sheyenne Street, West Fargo ND 58078; (701)-282-6630.

WELLESLEY HILLS MA
MAR 30

The Wellesley Amateur Radio Society will hold its annual spring auction on Saturday, March 30, 1985, beginning at 11:00 am, at the Wellesley Hills First Congregational Church, 207 Washington Street, Wellesley Hills MA (on Route 16 at the intersection of Route 9). There is no admission charge. Check-in will start at 10:00 am. Commission is 15%, with a $1.00 minimum and a $30.00 maximum. There will be free parking and food available. Talk-in on 147.63/.03. For more information, contact Nels Anderson K1UR at (617)-872-5259.

UPPER SADDLE RIVER NJ
MAR 30

The Chestnut Ridge Radio Club will hold a ham-radio flea market on March 30, 1985, at the Saddle River Reformed Church Education Building, East Saddle River Road and Weiss Road, Upper Saddle River NJ. There is no admission fee. Tables are $10.00 for the first one and $5.00 for each additional table. There is a $5.00 fee for tailgating. Food will be available. For more information, call Jack Meagher W2EHD at (201)-768-8360 or Roger Soderman KW2U at (201)-666-2430.

EGG HARBOR CITY NJ
MAR 30

The Shore Points Amateur Radio Club, Inc., will sponsor Springfest 85 on Saturday, March 30, 1985, from 9:00 am to 2:00 pm, at the Atlantic County 4–H Center, Egg Harbor City NJ (about 15 miles west of Atlantic City). There will be 8000 square feet of heated indoor space; covered tailgating will be available, weather permitting. Admission is $5.00 for sellers (bring your own table) and $3.00 for general admission ($2.50 in advance). There is a limited amount of ac in the indoor space. For more information, contact SPARC, Box 142, Absecon NJ 08201.

COLUMBUS GA
MAR 30–31

The Columbus, Georgia, ARC will sponsor a hamfest on Saturday, March 30, 1985, from 9:00 am to 5:00 pm, and Sunday, March 31, 1985, from 9:00 am to 3:30 pm, at the Columbus Municipal Auditorium, Columbus GA. There will be ARES and MARS forums, an open-air flea market, free coffee, and free parking for self–contained RVs (no hookups). Indoor tables are $6.50 per day. Tickets are $1.00 each, 6 for $5.00, and 13 for $10.00. Talk in on 146.01/.61. FCC exams will be given on Saturday morning. For more information, contact George M. Reitz N4AGO, RR2, Box 22D, Seale AL 36875; (205)-855-2204.

DIXON IL
MAR 31

The 19th annual Rock River ARC Hamfest will be held on Sunday, March 31, 1985, beginning at 8:00 am, at the Lee County 4-H Center, one mile east of the junction of Routes 52 and 30. Tickets are $2.00 in advance and $3.00 at the door. 8-foot tables are $5.00 and inside space for the flea market is $3.00. There will be food available. Talk-in on 146.37/.97 and 444.700/449.700. For advance tickets (available until March 15) or further information, contact Shirley Webb KA9HGZ, 618 Orchard Street, Dixon IL 61021; (815)-284-3811.

TIMONIUM MD
MAR 31

The Baltimore Amateur Radio Club, Inc., will hold the ARRL-approved 1985 Greater Baltimore Hamboree and Computerfest

on Sunday, March 31, 1985, from 8:00 am to 4:00 pm, at the Maryland State Fairgrounds Exhibition Complex, east of I-83, Exit 17, just north of Baltimore, in Timonium MD. Admission is $4.00 and children under 12 will be admitted free. There will be a special commercial exhibitors' and dealers' area, a giant indoor flea market, a large hard-surface tailgating area, an ARRL forum, FCC license exams, and guest speakers. Talk-in on 146.07/.67 and 146.52 simplex. For additional information, contact GBH&C, PO Box 95, Timonium MD 21093-0095, or phone (301)-561-1282.

MADISON OH
MAR 31

The Lake County Amateur Radio Association will hold its seventh annual Lake County Hamfest and Computer Fest on Sunday, March 31, 1985, from 8:00 am to 4:00 pm, at Madison High School, Madison OH (40 miles east of Cleveland). Admission is $3.00 in advance and $3.50 at the door. A 6-foot table is $5.00 and an 8-foot table is $6.50. Setup begins at 5:30 am. All display space is indoors and there will be plenty of free parking. Talk-in on 147.81/.21. For information or reservations, send an SASE to Lake County Hamfest Committee, 713 W. Jackson, Painesville OH 44077; (216)-953-9784.

GRAYSLAKE IL
MAR 31

The Libertyville and Mundelein Amateur Radio Society (LAMARS) will host LAMARSfest 1985 on March 31, 1985, beginning at 8:00 am, at the Lake County Fairgrounds, Grayslake IL. Setup begins at 6:00 am. Admission is $2.00 in advance and $3.00 at the door. There will be a large indoor electronics and radio swapfest, commercial exhibits, code-speed efficiency testing, food, and free parking. Talk-in on 146.94 and 147.63/.03. For more information or for reservations, contact LAMARS, PO Box 751, Libertyville IL 60048; (312)-255-8717.

WOOD COUNTY WV
APR 14

The second annual NWWVRA Hamfest will be held on April 14, 1985, from 8:00 am to 4:00 pm, at the Wood County 4-H Grounds. There will be an all-indoor flea market and dealers are welcome. Admission is $3.00 and flea-market spaces are $3.00 each. There will be food and XYL activities. Talk-in on 147.360/.960. For further information, send an SASE to Jim Whitlatch, 5007 Elmwood Avenue, Parkersburg WV 26101, or call (304)-422-7157.

BEDFORD PA
APR 14

The Bedford PA, Altoona PA, Somerset PA, and Cumberland MD Amateur Radio Clubs and the Blue Knob Repeater Association will sponsor the third annual Southern Alleghenies Hamfest on Sunday, April 14, 1985, from 7:00 am to 4:00 pm, at the Bedford County Fairgrounds, one mile west of Bedford on Route 30 and one half mile west of the Route 220 Bypass (close to the Bedford Exit of the PA Turnpike). Admission is $3.00, tables are $5.00, and outside tailgate spaces are $2.00. Dealers can set up the day before. Talk-in on 145.49/.89, 444.2 +5 MHz, and 146.52. For more information, contact Joel Cunard KB3TR, RD 6, Box 104, Bedford PA 15522; (814)-623-9697.

FRAMINGHAM MA
APR 14

The Framingham Amateur Radio Association, Inc., will hold its annual spring flea market on April 14, 1985, beginning at 10:00 am, at the Framingham Civic League Building, 214 Concord Street (Route 126), Framingham MA. Sellers can set up at 8:30 am. Admission is $2.00 and tables are $10.00 (which includes one free admission) and preregistration is required. Food will be available. Talk-in on .75/.15. For more information, contact Joe Weiner K1VVC, 52 Overlook Drive, Framingham MA 01701; (617)-877-7166.

ROCHESTER MN
APR 20

The Rochester Amateur Radio Club, Inc., will sponsor the eighth annual Rochester Area Hamfest on Saturday, April 20, 1985, starting at 8:30 am. Tables are $8.00 each. Setup is on Friday, April 19, from 4:30 pm to 8:30 pm. For more information, contact the Rochester Amateur Radio Club, 2253 Nordic Ct. NW, Rochester MN 55901; (507)-288-7688.

SOMERSWORTH NH
APR 20

The Great Bay Radio Association will sponsor the Springfest 85 flea market/hamfest on Saturday, April 20, 1985, from 9:00 am to 3:00 pm, at the Somersworth Armory, Blackwater Road, Somersworth NH. Admission is $1.00 and tables are $8.00 (includes one admission). There will be food and free parking. Talk-in on 146.40/147.00. For table reservations or more information, write to Great Bay Radio Association, PO Box 911, Dover NH 03820.

GRAND JUNCTION CO
APR 20

The Grand Mesa Repeater Society will hold the sixth annual Western Slope Amateur Radio and Computer Swapfest on Saturday, April 20, 1985, from 10:00 am to 4:00 pm, at a location to be disclosed later, in Grand Junction CO. Admission is free and tables are $5.00 each. Features include an indoor swapfest, exams, an auction, and refreshments. Talk-in on 146.82 and 449.200. For further information or to reserve a table, send an SASE to Larry Brooks W0ECV, 3185 Bunting Avenue, Grand Junction CO 81504; (303)-434-5603.

FITCHBURG MA
APR 27

The Montachusett Amateur Radio Association will hold a flea market on Saturday, April 27, 1985, from 9:00 am to 3:00 pm, at the Knights of Columbus Hall, Electric Avenue, Fitchburg MA. Admission is $1.00 and tables are $8.00 each. Sellers can set up at 8:00 am. Talk-in on 144.85/145.45 and 146.52. For table reservations or more information (make check payable to M.A.R.A.), contact Jim Beauregard, 7 Mountain Avenue, Fitchburg MA 01424.

SULLIVAN IL
MAY 5

The Moultrie Amateur Radio Klub (MARK) will hold a hamfest on Sunday, May 5, 1985, from 8:00 am to 3:00 pm, at the Moultrie County 4-H Fairgrounds, five miles east of Sullivan IL. There will be a heated indoor and large covered outdoor flea market. There is no charge to vendors, and space is available on a first-come, first-served basis. Vendors can set up on Saturday, May 4, but there are no overnight hookups. Talk-in on .655/.055 and .52. For more information, write MARK, PO Box 79, Sullivan IL 61951, or call Vernon Jack K9SWY at (217)-728-7596.

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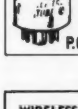
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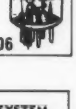

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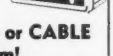
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✓ See List of Advertisers on page 80

REVIEW

THE MICRO HTs

It used to be said that bigger was better, but in this day of "state-of-the-art" electronics, smaller is better. Well, if that's really the case, then the new Kenwood TH-21A two-meter HT (hand-held) must be the best.

History

It was only a few short years ago, in the early 70s, that the typical ham using an HT on 2-meter FM was found holding a radio with one- or two-channel capability, an 18-inch pullout antenna, and a weight of better than two pounds. I always referred to these HTs as "bricks." The size and weight was about the same as a brick.

With the advent of phase-locked loop (PLL) and central processor unit (CPU) usage in the typical HT of today, the operator is no longer "rock-bound" to only a few repeater or simplex frequencies.

The current crop of 2-meter HTs is hot with feature-loaded units, having hundreds of possible frequency pairs, memory and scanning capabilities, and some even tell the time. However, as with everything, they all have drawbacks. All require considerable dexterity to completely utilize their many features, and all are a real handful in the size and weight department. The typical weight exceeds one pound and is even more if a large-capacity battery is installed. But these units are state of the art, feature-wise.

How about something that is state of the art, size-wise? How about something that is small and simple to operate?

The Kenwood TH-21As

Apparently, I'm not the only one to think that a smaller, simpler-to-operate HT would be nice. The folks at Kenwood thought so and kindly introduced the TH-21A (TH-21AT with DTMF keypad).

The new TH-21A is so small that my first impression left me wondering if it was a child's toy, or if someone from the *USS Enterprise* had left their communicator behind. It's really size impressive.

The little unit readily fits into a shirt or jacket pocket yet is so light that it will not pull your clothing askew. The size is comparable to a pack of 120mm cigarettes, and the weight is about 10 ounces.

Operation

I found that the TH-21A was quite simple to operate and displayed no bad habits.

All controls, except repeater offset (−600/simplex/+600) and power selection (hi/low), are on the top of the case. Although small, I found none to be cumbersome to operate.

The available audio is more than enough for comfortable listening—actually considerably more than my full-featured monster—and is very intelligible. Frequency selection is made by use of thumbwheels.

The battery slides onto the back of the TH-21A for use and is removed for recharging. It is not possible to recharge the battery while it is on the radio.

In actual use I was very skeptical of the small battery. It only has a 180-milliampere-hour rating. Yet I worked the radio all evening, on several repeaters, and did not kill the battery. However, in all fairness, I must admit to using low power on the closer machines.

During my QSOs, I asked of course about the quality of my audio and apparent signal strength (am I full quieting into the repeater?). I made no mention of the fact I was testing a new rig until after signal reports were exchanged. No negative comments about the audio were heard; in fact all reports were good to excellent. Regarding power, on the close-in repeaters I was full quieting on low power. For the others I needed high power.

In making an autopatch I didn't have to hold the PTT switch after pushing the first number. The rig stays keyed for 1-1/2 seconds after the last digit is depressed. This is not unique but is a handy feature.

I made a few quick measurements to check the specifications:

- rf output power
  (hi): 1.5 W
  (low): 250 mW
- receiver sensitivity
  open squelch at: .05 microvolts
  12 dB SINAD at: .15 microvolts
- transmitter frequency
  found to be 95 cycles high
- deviation
  +5 kHz to −5 kHz

The measurements were made by use of Wavetech, Cushman, and Bird instruments.

Remarks

Operationally I have to give high grades to the new TH-21A. It is everything I would expect of a good HT. For handiness I'd have to rave on and on. The diminutive size and bantam weight of this micro HT are its strongest points. It is approximately one half the size and weight of my trusty ICOM 2A, yet has the same features and similar specifications.

I can make only two negative comments. First, the operator must remember that the battery life is rather limited. Installing a larger battery would only negate the size value of this radio. I recommend the purchase of an extra battery. Second, the antenna should have been made in the "short duck" style. This would be better for shirt-pocket operation. I'm sure the after-market people will take care of this shortcoming in a hurry.

SPECIFICATIONS FOR THE TH-21A AND TH-21AT

General	
Frequency range	144 MHz to 148 MHz
Signal type	F3
Antenna impedance	50 Ohms
Power requirements	
Voltage	5.8 to 10.0 V dc (nominal 7.2 V dc)
Consumption	standby—less than 28 mA XMIT (high)—600 mA (low)—300 mA
Dimensions	width 2-1/4 inches height 4-3/4 inches depth 1-1/8 inches
Weight	9.8 ounces (with antenna and battery)
Transmitter	
Output power	(high) 1.0 W (low) 150 mW
Modulation system	reactance
Max. deviation	±5 kHz
Receiver	
I-fs	first 16.3 MHz second 455 kHz
Sensitivity	S/N more than 28 dB at .5 microvolts 12 dB SINAD at .25 microvolts
Selectivity	−6 dB at more than 12 kHz −40 dB at less than 28 kHz
Af output	more than 250 mW

Accessories Available

- PB-21 rechargeable nicad battery pack
- BT-2 battery pack for AAA alkaline batteries
- EB-2 external battery pack for on the belt
- DC-21 dc-to-dc power supply for mobile operation
- SMC-30 speaker/mike
- HMC-1 headset with VOX
- SC-8 carrying case
- AJ-3 antenna-to-BNC adapter
- TU-6 tone unit

For additional information, contact *Trio-Kenwood Communications, 1111 West Walnut Street, Compton CA 90220.* Reader Service number 488.

Bill Clarke WA4BLC
Falls Church VA

The largest thing about the TH-21AT is the antenna.

With its cover off, the TH-21A reveals a well laid out transceiver. On the left is the slide-on battery.

VIC MSO—A MODERN MAILBOX

I have always loved getting mail! From as early as I can remember I have carefully tracked my postal carriers, knowing just what time I can expect them to deliver mail to my address.

Amateur radio seems to have strengthened my obsession with the mail. Even as a teenager I was always waiting for an envelope from the QSL bureau, or the latest issue of *73*.

Now I've been thrown a curve. Oh, I can still count on my regular mail to be there when I expect it, but somebody came up with "electronic mail." It comes whenever it feels like it!

An outgrowth of the computer revolution has been the implementation of message-storage operations, or MSOs for short. The first ones required a lot of dedicated hardware. Now it's possible to have your own MSO that will run on a VIC-20. The computer must be expanded by at least 8K of memory. The Commodore 64 will work equally well.

Mark Mumaw NU6X of Vid-Com Communications, 3131 Foothill Blvd., #H, La Crescenta, California 91214, has written VIC MSO. It's a very powerful program for Commodore computer owners interested in having their own MSO.

In operation, VIC MSO lies in waiting,

continually looking for its "turn-on" code. Something like MSOKA9XYZ is usually used. Once activated, it responds with a log-on message and awaits instructions.

Most MSOs operate in a similar fashion, and VIC MSO emulates its big brothers and sisters. A simple ".HELP" command will return the full set of user commands, so even the first-time user can navigate around the system.

The list of commands is fairly extensive, too. You can read, write, and delete messages. The DIR option returns a directory of everything in the system, or an SDIR followed by a keyword like your callsign scans the directory for any messages containing the keyword you are looking for.

VIC MSO is very versatile. It will speak and listen in 60-, 75-, and 100-wpm Baudot (Teletype®) code or at 110-baud ASCII. The mode is selectable by the user.

A system-operator (that's you) mode allows local control of the program without actually going on the air. Additionally, VIC MSO can be used for regular RTTY and ASCII work in the direct mode. There are few features in the direct mode, but it's handy if you want to do a little real-time communicating without crashing the MSO program.

Besides the program, you will need a VIC-20 or C-64 computer, a terminal unit, and a cord to connect from the computer to the TU. Full instructions are included on how to do this.

Kantronics interface owners can for an additional fee purchase a cable "ready to fly." The cost is $5.00. VIC MSO communicates through the user port (RS-232 port) on the computer, so the regular cord supplied with Kantronics and AEA software that connects to the joystick port will not work.

The design on VIC MSO allows even amateurs without a disk drive to participate in MSO operation. The program itself is available on disk or tape and will run without a disk drive.

Disk drive owners will find that storage capability is increased since messages are stored and retrieved from disk when it is available.

The timekeeper program in VIC MSO keeps track of the time, time zone, and date and logs them on each operation. Part of the same routine will deactivate the MSO in the absence of input after several minutes.

From a programming standpoint, VIC MSO is broken into three major segments. A loader program calls the other two programs, so the second and third parts are invisible to the user.

A machine-language program is used to help speed the operations of VIC MSO, and a Basic language main program rounds out the picture.

My criticisms of VIC MSO are few, and some of them were being addressed before I even mentioned them. Currently, no provision is made for text editing. Mark indicates that improvement is "under construction."

Due to the copy-protection scheme employed, modifications to the program, such as the MSO activation code, are not intended to be user changeable. A simple addition to the program could leave the copy protection intact and still allow a user-selectable activation code.

Finally, I'm a bit nervous about the delete command. Any user can delete any message. I'd like to see the program allow for some protection, at least on system-operator-generated messages.

Now when I get up and go to work in the morning, my electronic mailbox works all day for me, ready to receive correspondence on a moment's notice. Now I have two mailboxes to check. That's great until I start receiving junk mail electronically!

VIC MSO is available from Vid-Com for $59.95 plus $1.90 postage and handling. Owners requiring the Kantronics interface cord should include an additional $8.95. For those in a hurry, the telephone number is (818)-957-7550.

For more information, contact *Vid-Com Communications, 3131 Foothill Blvd., #H, La Crescenta CA 91214.* Reader Service number 486.

Jim Grubbs K9EI
Springfield IL

THE HIDDEN SIGNALS ON SATELLITE TV

Everyone by now is familiar with the enormous quantity of television signals available from geosynchronous satellites. Across America, home satellite dishes are springing up in backyards, all pointing skyward to glean the ripe harvest of information being beamed to earth. The range of programming runs from 24-hour news to rock-music videos to educational and religious features. But few know of the "secret" side of the satellites, the ever-present non-video information broadcasts.

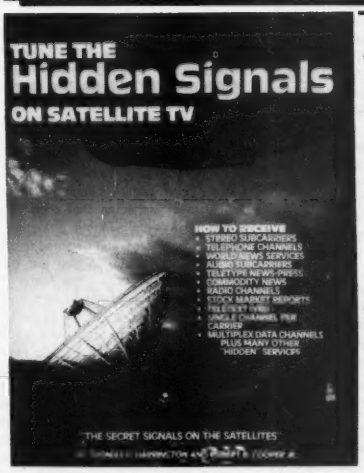
The Hidden Signals on Satellite TV is about this less frequently understood function of the satellite service. Written by Thomas Harrington and Bob "Coop" Cooper, the book is a complete guide to non-video satellite transmissions. Both authors bring their specialized knowledge to the effort, and their names have become well known in TVRO circles. Tom Harrington, a member of the Board of Directors of SPACE, has worked in the TVRO field for many years, dealing almost exclusively with satellite data transmission and reception. Bob Cooper is probably best known as the Publisher and Editor of the very popular *Coop's Satellite Digest* and *CSD/2*. Bob has 22 satellite antennas at his test range in the Turks and Caicos Islands, where he also provides commercial television service to the island residents.

Hidden Signals is divided into eight major sections, covering every type of non-video signal that is available on the satellites. The book begins with a concise explanation of satellite transmission formats and techniques. The following chapters explore audio subcarriers and where to find them, telephone systems, narrowband FM and digital services, satellite networking, various teletext formats, and news services. Handy appendices include a complete list of satellites and their transponders and a table giving each satellite's name and position. In addition, Chapter 1 provides an exhaustive look at each satellite transponder (there are hundreds!) and details what you might expect to hear on each one.

One of the things I liked best about this book is the clarity of its presentation. Bob and Tom don't assume that you know everything about satellite systems, and each important concept is given the careful explanation that so many references of this type lack. Vivid illustrations drive each point home. And they've set *Hidden Signals* up in a way that allows the more knowledgeable reader to skip the basics and get on to the main course. One slight drawback is the lack of a complete index, but if you know generally what you are looking for, a quick scan of the table of contents will net the appropriate chapter.

There is a great wealth of information

THE HIDDEN SIGNALS ON SATELLITE TV
"THE SECRET SIGNALS ON THE BIRDS"



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Perry Denham KW1O
73 Staff

AEA'S MICROAMTOR PATCH™

I suppose the basic question is whether or not you can teach an old dog new tricks...and, believe it or not, Mike Lamb N7ML has proven that you can. Let me explain.

I grew up in amateur radio during the 1950s, when Teletype® meant clanking, heavy, noisy, and sometimes balky Model 15s or, if you were really lucky, a Model 19. Your shack sounded just like the newsroom of the *Daily Planet*...and your family, if any remained after the first operating session, lived with Mother.

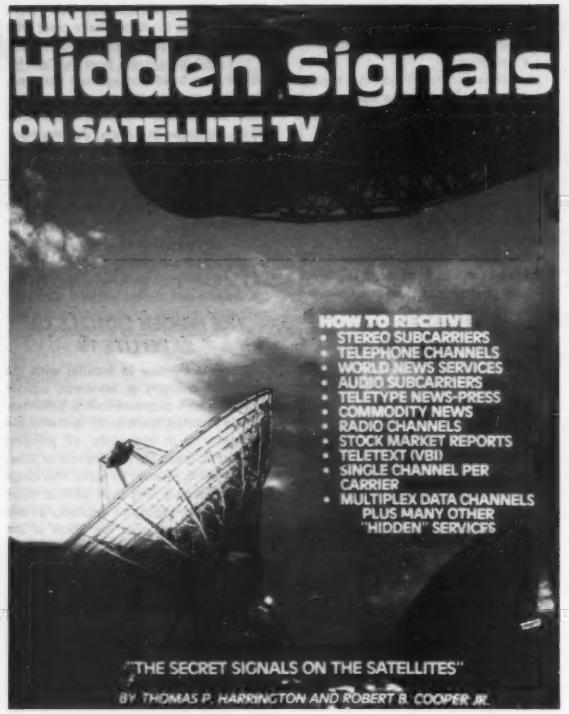
Then, things became smaller and smaller, TUs became solid state, and Models 28ASK and 28FSK machines appeared. Still, none of this was for me; I was not into mechanical monstrosities at the time, nor am I today. If RTTY was ever to appear in my shack, the drawbacks would have to go. As a consequence, I missed all of the fun and charm of old-time RTTY and the weird, clackety-clack machines, the tape reperforators, and all of the reams of yellow, coarse paper piled up on the floor. Yes, and the oak rolltop desks and Collins 75A1s, too. Ah...those were the days! Still, I didn't bite and the RTTY mystique passed me by.

Too late, I thought, for an old dog like myself to update now—to learn a ham's lifetime of new lingo—and to get into the funny world of Baudot, 5-bit codes, and (ugh!) *typing*. I'd better explain. A good share of my life is spent typing: columns, newsletters, correspondence, and the like...but you must realize it's not "touch" typing. My version is two-fingered sight typing, and if I can't look at the keys, I don't know where I am or what I am doing. So, take that as a starting point and tell me how or, for that matter, *why* someone like me would even be interested in this new/old mode. Well, I'll save you the trouble: *curiosity*.

Frankly, I am just plain curious about what goes on in the world of auto diddle, chirp-chirp, and quick brown fox. But, as Churchill was supposed to have said, "Oh, how I love to learn, but how I hate to be taught!" I'm something like him in at least that one way—I didn't want to make the effort. Shame on me!

Now we get to the best part: Mike Lamb, President of Advanced Electronic Applications, changed all that by telling me that what I really needed, and what my life up until now was lacking, was the new MAP-64/2 MicroAMTOR Patch, a RTTY TU and interface that is plugged in between your Commodore 64 microcomputer and your station transceiver. That, the manual, plus the tiniest bit of reading was all I would need to become a new member of that fraternity of RTTY buffs.

Mike promised that it wouldn't hurt at all and that I might even *enjoy* it. "C'mon, Jim, you get the C-64, and I'll send the patch, okay?" Somewhat reluctantly I agreed, even then realizing that the two worn index fingers on my hands would be taking a double beating—pounding the C-64's keyboard and this typewriter for the review.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"THE SECRET SIGNALS ON THE SATELLITES"
BY THOMAS P. HARRINGTON AND ROBERT B. COOPER JR.

The Hidden Signals on Satellite TV *from Universal Electronics.*

First things first: I had no microcomputer, so I went to the good folks next door at *RUN* magazine (a sister publication, devoted to the Commodore computers and their owners) and gently twisted the arms of Hal Stephens, the Advertising Sales Manager, and Guy Wright, the Editor, for the loan of a machine. I promised them anything and everything within my power, including bribery, and went home carrying a C-64 terminal and a matching color monitor. There, the AEA MicroAMTOR Patch (MAP-64/2) awaited me, having been delivered a few days before.

You might want to know that I am definitely computer-untutored—unfriendly, if you will—an analog man in a digital world, a fish out of water! Get the picture? Right! So it was with some amount of trepidation that my shaking fingers dug into the boxes as I wondered which piece of apparatus would byte (oh, no!) first.

Maybe you would like to know what you get for your money before you decide to plunk down $199.95 for this latest means of communicating with the world. Fair enough—let's have a peek at the MicroAMTOR Patch, find out what's inside, and see what it is supposed to do. This is going to be nontechnical, so relax.

Imagine a thin black box about the thickness of a paperback novel and just a little larger in width and length. On one side there is a protruding edge connector that fits into the expansion port on the right rear apron of the C-64. There is also a five-conductor cable that connects between the interface and the user port on the left rear apron of the C-64. The cable is all prepared with proper connectors on both ends. The MAP-64/2 does not come with a source of dc power (12 volts at 200 mA), so you will have to borrow some from the rig or from an ac adapter (which you probably have already). On the rear top of the box, in plain view, are three red LEDs and a green LED. The three red ones are to assist you in properly tuning Morse, RTTY, ASCII, and AMTOR signals, and the green one is to tell you when power has been applied to the patch—it lights up green for "go."

On the rear apron of the patch are some RCA-type jacks and 3.5mm speaker/audio jacks. These are labeled FSK, Key Line, Audio In, Audio Out, and 12 V dc. The lights are labeled, too—the left one is Mark and the right one is Space...and I forget what the center one is labeled, but when properly tuned to any of the signals capable of being decoded by the patch, it will be lit all the time...so I don't worry about it. Three push-button switches on the rear panel select CW, RTTY narrow (170 Hz), or RTTY wide (850 Hz). MicroAMTOR Patch is a software/hardware interface package that incorporates MBA-TEXT *and* AMTORTEXT software for the Commodore 64 computer. It uses active filters to provide the necessary filtering for 170-cycle and 800-cycle shifts for wide and narrow RTTY and for CW. The software is built into ROM, that is, IC chips which guide the transmit/receive operations and provide a full multimode capability.

A shielded interface cable is provided to carry AFSK and PTT signals to the transceiver. You have to provide the appropriate connectors, and the manual suggests using the microphone connector. However, the little Yaesu FT-757GX transceiver that I am using has AFSK input and PTT input on the back of the rig, using RCA-type connectors, so I didn't have to wire a microphone plug. The cable is fully shielded to reduce EMI problems.

Being one to try to "wing it" wherever possible, I uncharacteristically decided to read the manual first. I hope that this doesn't cause any of you hard-core types to lose respect for me. I'd suggest you read it, too, as there is a lot of good information that you'll need to know. The manual is in three parts: a description of the MAP-64/2 including wiring diagrams and pinout information, a complete set of hookup instructions (with checkout procedure), and a list of possible problems and their cures. In addition, there is a portion on AMTOR theory, with instructions on how to operate your computer/interface/transceiver in all of the possible modes: AMTOR, RTTY ASCII, and Morse. For those of you with transceivers capable of frequency-shift keying (FSK), there is an FSK output from the patch that will permit you to use this mode as well.

Now, let's talk about what you can *do* with this little gem. Being very familiar with CW, and not at all with RTTY, ASCII, or AMTOR, I decided to familiarize myself with the interface by using it to communicate on CW at first, perhaps to get courage to face the unknown...after all, it's easier to defeat fears a few at a time.

I connected things according to the book but couldn't get it to print alphanumerics to the screen. Checking the "Problems-Solutions" table, I found that the most likely problem area was the five-conductor cable that runs between the patch and the computer. The troubleshooting guide suggested that the plug was reversed (it was not), but it really pointed to the fact that I should peek into the socket to see what was happening, if anything. Aha! Somehow the pins had become misaligned with the hole, and the plug was not mating properly. A quick tweak with my fingers brought everything into line, and the plug was reinserted. Voila! We got good copy on the screen. Morse characters flowed smoothly from left to right just like the book said. You know something? I've always suspected that those high-speed guys were sending gibberish instead of real Morse, and I wanted to prove it. I tuned into a station that was going faster than I can copy—*lots* faster. The screen said the speed was 60 wpm, and by Jove, it printed out that Morse as pretty as can be! What's more, they were actually saying something...and I could read it just as nice as can be. True, they weren't saying anything bad about *me* (or anyone else for that matter—another unfounded suspicion laid to rest) and the stuff it printed was not gibberish. It was about as common as most of us receive at 20 per. Oh well...

Next, I tried sending Morse. The top left of the screen shows you what speed you are sending, and you can select any speed you want just by punching the right func-

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73 Magazine*, Peterborough NH 03458.

tion key on your computer. The default speed is 20 wpm, so I used that to start and called a CQ. You load the buffer first (if you wish) and when the message is all ready, press f3 and let it go. The transceiver springs to life, and all the meters read properly...just like some little guy inside there was doing all the work. It was the first time I had ever sent CW with my arms folded, leaning back in the chair. End of message and—PANIC! Bloomin' thing didn't shut off by itself...oops, quick—where's the book? Oh yes, here it is. Punch f1 to shut it down. Things went back to receive, and—wonder of wonders—here comes a station back to the CQ. We had a nice chat...and you know what he told me? He said, "You sound just like all that other machine-sent Morse—perfect copy, and absolutely nothing to complain about...but it doesn't sound like *you* Jim," (implying, of course, all my faults)! So far, so good; everything going according to plan.

Am I brave, I wondered? *Really* brave? Aw shucks, the inside guy said, c'mon, give RTTY a try. Back to MENU, select R, check to see that 60 baud shows in the upper left, and the *receive* section is lit up. Tuning across 80 meters, I found a nice strong signal and discovered the little RYRYRYRYRYRY figures marching across the screen followed by a CQ, CQ, CQ and a station identification, and ending with PSE K K K. Summoning up the courage and typing madly, I managed to get something into the QSO buffer before he signed, then I hit f3 and waited. Would he come back? After depressing f1 (listen), I heard nothing. Shucks, what have I done wrong? Then, magically, the screen sprang to life with my call: W1XU, W1XU, de...and it was as big a thrill, I tell you, as my first-ever QSO way back in 1950!

To tune in the RTTY signals, you make sure the switch on the rear panel is depressed in the 170-cycle position, and that the "wide" or "CW" switches are not depressed. This selects the proper Chebyshev filter for proper demodulation. Then, tune across the signal and watch the little red LEDs. When the center one is on steadily, the right-hand one (space) is blinking on and off, and the left one is blinking occasionally, you have it pretty well tuned and should see readable print. If not, you could try a couple of other things, such as selecting another speed (from a choice of 67-, 75-, 110-, and 132-baud rates). If undecided, you can ask your AMTOR Patch to "guess" what the received speed may be. Then select the one it guesses. I found through a lot of listening that there are a lot of stations sending at the 110-baud rate—electronic bulletin boards (MSO stations) for example.

Once or twice I checked the ASCII mode and found signals that were copyable. Other times, no matter what I did, I couldn't find any variation of filters and tuning that would produce readable copy. Then, by chance, I tried the "Invert" mode; lo and behold, there were a couple of stations talking to each other and complaining that they couldn't get any contacts. Obviously, they were newcomers like myself, who may not have read the book! Or, maybe they wanted to carry on in secret, but I don't think so. *Read the book!*

Finally, I want to comment about AMTOR—the "new" mode that has been around for years, commercially. Frankly, *that* really shook me up, because there are so many things to learn: how to call up a station or answer a calling station, what keys to use for various commands and options, an edit feature, a chance to use up those 10 empty message buffers, and all kinds of unexpected goodies that take a while to learn and really understand. No, I've not learned them all yet, but before telling you about getting my own station on AMTOR, receive and transmit, I'd like to mention a funny thing that happened last summer. The shack windows were open, and the weather was hot and humid. My wife had been listening to the AMTOR chirp-chirp for a while and—since I wasn't in the shack at the time—asked me to turn off the station...which I did (well, I turned it down, anyway). A little while later, she asked me why I hadn't turned off the AMTOR. I replied a bit testily that I had, indeed, turned if off—to which she replied, "Well, you just go look!" So, I went and found a cricket just outside the shack window chirping in sympathy with the AMTOR signal which must have attracted him (or her?). I wonder what AMTOR says in cricketese?

There are two basic AMTOR modes: mode A (ARQ) and mode B (FEC). Mode A is the automatic-request mode which is used for most middle-distance QSOs and is the "handshake" mode whereby the stations' signals are interspersed with each other, and phase-locking takes place. The FEC mode is the forward-error-correcting mode. It is used for very short or very long distance QSOs, for calling CQ, for bulletin transmissions, and for net operation. This mode sends each letter or number twice and goes on without waiting to see if the material has been received correctly. This is much like ordinary transmission. FEC is not intended to provide error-free copy.

The status panel in the upper left of the screen always tells you what's going on: listening, standby, phasing, idling, transmitting, or receiving—by your own station or by a station you are listening to.

When you use AMTOR, you will be using your Selcal, a convention that has been adopted for operation in the AMTOR ARQ mode. A Selcal is a four-letter code block recognized by your station's software and by the other station's software. It contains four letters from your call and is made up as follows: W1XU becomes WWXU, N7ML becomes NNML, KA1GAV becomes KAGA, and KK2Y becomes KKKY. Actually, you could choose what you want, like CQCQ, but it is considered better form to use the Selcal made up from your own callsign. The Selcal permits phasing lock between stations and initiates the message-transmitting/receiving process.

At first, I was quite successful in transmitting and receiving AMTOR messages in the FEC mode and in receiving AMTOR in the ARQ mode. But I was having a very bad time trying to synch my ARQ transmissions with the other station's chirps. This should have been done automatically but was not.

After reading everything I could find on the subject and looking over all of the equipment (including making some simple checks), I concluded that the computer's clock was not keeping time accurately. Just to check, I compared UTC with onboard time after setting the time into the program and waiting about an hour. I found the difference almost 2:1! ARQ permits up to a .3% difference in computer clocks for proper phasing (about 0.2 seconds per minute), but this was ridiculous!

The only answer would be to obtain another C-64. Thanks again to Guy Wright, I got one quickly. Taking it back to the station and plugging it in set things right; the program clock could now be set and would hold reasonable time over a period of several hours (within a second or two) and certainly within the limits of tolerance permitted.

Well, how does it work? Or should I say, how *well* does it work? Only you can be the judge, of course, but for me it works mighty well indeed. My biggest delight was calling up NNML, leaving a message for Mike in the Auto AMTOR mode, and having his machine respond by acknowledging the message and then shutting down. One could easily visualize two AMTOR-equipped machines in the auto mode talking to each other without an operator present at either station! I think I read a fiction article like that a few years back, but it's now apparent that yesterday's fiction is today's fact.

For further reading, you might wish to check Mike Lamb's article about AMTOR in the November, 1983, issue of *CQ*. It is clear, concise, and helpful, as is the manual which comes with the interface.

AMTOR has been approved for amateur-radio use since January 27, 1983, yet there seem to be surprisingly few stations that I can hear at my location that are using this relatively new mode.

For sure, it's not as fast as RTTY under ideal conditions, but in spite of its seeming slowness, it appears to be immune to fading and interference, guaranteeing essentially error-free reception and transmission.

Occasionally, you will find word bursts that appear garbled, but you can soon see that they are made up of three-letter repeats where perhaps one, two, or all three characters of the previous group had not been received properly. The print would stop, a request for repeat was automatically transmitted, and the retransmitted characters completed the word, adding the letters onto those that had been properly received before.

Well, you can imagine what a thrill it was to get my first AMTOR QSO, Mark Hald K2KI (KIKI). I met Mark on RTTY (old-fashioned kind) and we talked about AMTOR. Mark mentioned that he, too, had problems at first in trying to figure out how to use AMTOR.

Most of the manuals and articles tell you all about what it is, what it does, and why you need it, but very few tell you exactly *how* to use it or what to expect. For instance: Did you know that both stations in mode A will be going all the time? That is, they will be chirping continuously as long as you are in contact with the other station in that mode? Sure, it's easy to see after the fact (and after you have been through the procedure once), but not beforehand. Here's another thing: Did you know that *both* stations have to insert the *same* Selcal into the program in order to work each other properly? No? Well, I didn't either, and I couldn't find it explained anywhere. Oh, yes...they explain the Selcal and they explain the reason for it, but they fail to tell you that if it's *your* Selcal that both stations use, then you are the "master" and the other is the "slave." If you use the other guy's Selcal, then he's the master and you're the slave...at least to start.

Now, where does it say that you can type information into the program while you are in the automatic chirping mode (mode A)? When the other station is accessed and types in your Selcal, and the two are synchronized, the information you have typed in will then be transmitted by you and received by the other.

It's all very easy *after you have done it once or twice*, but it's that first step that gets you every time. Maybe all of the manufacturers of interfaces should include a helpful ham with each package!

In any event, Mark led me by the hand through the first painful get-acquainted steps by patient suggestions and advice. After about ten minutes we were chirping away happily, with each station able to "break in" merely by using the + ? code.

I was quite amazed that I broke in once, managed to get my information across, and then Mark's station continued right where he had left off, without missing a beat.

The copy was nearly perfect; I say nearly because whatever errors were in it were input errors and not machine or program errors. The MicroAMTOR Patch worked flawlessly. Next, we try the *big time* on 20 meters!

You'll find that it is convenient at first to use mode B, which is not the chirp mode but instead a steady transmission of data, much like ordinary RTTY, except that the characters are sent and acknowledged in groups of three, each group being sent twice.

So, whether you use the Morse program, the standard RTTY program, AMTOR, or ASCII, AEA's interface will do it all for you: no strain, no pain.

Listen for me around 14.075 MHz some evening or on a weekend. I'll be happy to let you see for yourself what the AEA MicroAMTOR Patch can do.

For further details, contact *AEA, PO Box C-2160, Lynnwood WA 98036*. Reader Service number 487.

Jim Gray W1XU
73 Staff

HAM HELP

Help! I need a service manual for a Boonton sweep signal generator model 240-A. I will gladly pay copying and mailing costs.

Gordon Fulp W6FBH
4740 Scratch Pine Lane
Placerville CA 95667

I am in desperate need of a schematic (and any instructions) pertaining to an E. H. Scott Radio, 15-tube model L-322, vintage 1933/34. I will gladly bear any cost incurred.

J. Fred Belles
8563 Peebles Road
Pittsburgh PA 15237

I need a service manual for each of the following scanners: Electra Bearcat 210XL, Tennelec MCP-1 Memoryscan, Tennelec MS-2 Memoryscan.

I also would like info on using my TRS-80 Color Computer on RTTY.

Please advise me of any cost involved.

Peter J. St. Arnaud
PO Box 8066
Lowell MA 01853

I'm looking for a photocopy of the manual or circuit diagram for a CREI model 255 scope, a Sonar Monitor Receiver model FR-102, the W9TO tube-type keyer, and a Geloso model 4/102-V vfo which was made in Milano, Italy and uses a 6L6, a 6AU6, and a 6J5. I will reimburse copying costs or can photocopy and return the originals.

Robert Ross VE3LPJ
4 Meadowland Drive
Brampton, Ontario
Canada L6W 2R4

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

VIRGINIA QSO PARTY
Starts: 1800 UTC March 9
Ends: 0200 UTC March 11

The 1985 QSO Party is again sponsored by the Sterling Park Amateur Radio Club. The same station may be worked on each band, once on each mode. VA stations may contact in-state stations for QSO and multiplier credit. VA mobile stations must sign as mobile and may be worked in each new county they operate from for new QSO and multiplier credit, even if previously worked on the same band and mode in another county. Stations on county line borders count for only one QSO. QRP stations must run 5 Watts or less for their entire operating time.

EXCHANGE:

QSO number starting with 001 and QTH consisting of state, province, DX country, or VA county. VA stations note that the reference for valid counties is the *CQ* "Counties Award Record Book," which lists a total of 95 counties.

FREQUENCIES:

Phone—3930, 7230, 14285, 21375, 28575, and anywhere on the 160-meter band except the DX windows; CW—60 kHz up from the low end of each HF band, and anywhere in 160-meter band or Novice subbands.

SCORING:

Count one point per voice QSO, two points per non-voice QSO (RTTY, CW, SSTV). No crossmode QSOs. VA stations multiply total QSOs by the sum of states, Canadian provinces, DX countries, and VA counties worked. Others multiply QSOs by the number of VA counties worked.

AWARDS:

Engraved plaques to the top-scoring stations in the following categories: VA Single Operator (fixed location); VA CW Only; VA Mobile; Out of State (including DX); VA QRP. Certificates will be awarded to winners of each VA county, state, Canadian province, and DX country.

ENTRIES:

Follow ARRL standard contest guidelines for logs. Indicate each new multiplier as worked and include a summary sheet with your log. Indicate on summary sheet if you are operating mobile, QRP, or CW only. Entries must be mailed by April 1, 1985, and should be addressed to: Virginia QSO Party, c/o Barry Pybas KW4I, 313 W. Derby Ave., Sterling Park VA 22170.

WISCONSIN QSO PARTY
Starts: 1800 UTC March 10
Ends: 0100 UTC March 11

Use both CW and phone. Stations may be worked once per mode on each band. Mobiles may be worked again when changing counties. No repeater QSOs!

EXCHANGE:

RS(T) and state, province, or Wisconsin county.

FREQUENCIES:

Phone— 3890, 7290, 14290; CW—3550, 3725, 7050, 7125, 14050, 21150.

SCORING:

Phone contacts count 1 QSO point while CW contacts count 2 QSO points. Wisconsin stations multiply QSO points by total number of states, provinces, and Wisconsin counties. DX countries count for QSO points but not multipliers. Non-Wisconsin stations multiply QSO points by number of Wisconsin counties (72 maximum). As a bonus, Wisconsin mobiles can add 500 bonus points for each county that they operate from outside of their home county, with a minimum of 15 QSOs per county to qualify.

AWARDS:

Awards will be presented to the highest scorers in each state and province. Wisconsin awards to 10 highest single-operator entries, plus the highest multi-single and multi-multi entries, the highest Novice/Technician, and the highest aggregate club score. Each club member's station must be located within 50 miles of the club (except for mobiles).

ENTRIES:

All entries must contain a log consisting of: time in UTC, call, RS(T), state, Wisconsin county, mode, and a score summary. Summary must include your name, address, and callsign. Circle new multipliers as worked. Logs containing more than 100 QSOs must be accompanied by a dupe sheet, with a separate dupe sheet for each mode. Mobile entries must indicate county changes in log and submit a separate dupe sheet for each county. Entries must be postmarked by April 15, 1985, and sent to: Wisconsin QSO Party, c/o West Allis Radio Amateur Club, PO Box 1072, Milwaukee WI 53201.

BERMUDA AMATEUR RADIO CONTEST
Starts: 0001 UTC March 16
Ends: 2400 UTC March 17

This is the contest's 27th year, and again it is sponsored by the Radio Society of Bermuda. The contest is open to all licensed amateurs in Canada, USA, United Kingdom, and the Federal Republic of Germany. Of the 48-hour contest period, your total operating time cannot exceed 36 hours, with off periods clearly logged. Each off period must not be less than three consecutive hours. All stations must be single-operator only and must be operating from their own private residence or property. Use all bands, 80 through 10 meters. No crossband or crossmode contacts are permitted.

EXCHANGE:

All stations will send RS(T) reports and give the following: Canadians add province, UK stations add county, US stations add state, West German stations add DOK#, and Bermuda stations add parish (see Fig. 1). US and Canadian stations may exchange reports with West German, UK, and Bermuda stations only. UK and West German stations may exchange reports with US, Canadian, and Bermuda stations only. Bermuda stations may work stations in the UK, US, West Germany, and Canada only.

SCORING:

Each completed contact, on each band, counts 5 points. A phone and a CW contact with the same station on the same band will count if they are made at least 30 minutes apart. For all stations outside Bermuda the multiplier is the total number of Bermuda stations worked on each band. For Bermuda stations the multiplier is the total number of states, provinces, countries, and DOK#s worked on each band. A multiplier may be counted only once per band.

AWARDS:

Printed awards to the top scorer in each state, province, country, and DOK area. The top scorer in Canada, US, UK, and West Germany shall receive a trophy, to be awarded at the Society's annual dinner held in October of each year. Round-trip air transportation plus accommodation will be provided to overseas winners to enable them to receive their awards.

ENTRIES:

Logs must show all dates and times in UTC. A separate sheet must be used for each band. All contestants must compute their own scores and check for duplicate contacts. Dupe sheets must be submitted with logs to cover each band where more than 200 contacts are logged. For every duplicate contact for which points are claimed, a penalty of three contacts will be deducted by the Contest Committee. An excess of claimed duplicates may result in disqualification. No penalty will be exacted against duplicates for which no

SAN—Sandys
PEM—Pembroke
SOU—Southampton
HAM—Hamilton
STG—St. George
DFV—Devonshire
WAR—Warwick
SMI—Smiths
PAG—Paget

Fig. 1. Bermuda parish abbreviations.

CALENDAR

Mar 2-3	ARRL DX Contest—Phone
Mar 9-11	Virginia QSO Party
Mar 10-11	Wisconsin QSO Party
Mar 16-17	YL-ISSB Commo System QSO Party—CW
Mar 16-17	Spring QRP CW Activity Weekend
Mar 16-17	Bermuda Amateur Radio Contest
Mar 16-17	DARC International SSTV Contest
Mar 16-17	Kentucky QSO Party
Mar 23-24	Tennessee QSO Party
Mar 30-31	Rio CW DX Party
Apr 20-21	World Fishing Contest—VIGO 85
Apr 20-21	QRP ARCI Spring SSB Contest
Apr 27-28	Helvetia Contest
Jun 8-9	Worldwide South America CW Contest
Jun 8-9	ARRL VHF QSO Party
Jun 22-23	ARRL Field Day
Jul 1	CARF Canada Day Contest
Jul 13-14	IARU Radiosport Championship
Jul 20-22	CQ VHF WPX Contest
Aug 3-4	ARRL UHF Contest
Aug 17-18	New Jersey QSO Party
Sep 14-15	ARRL VHF QSO Party
Sep 14-16	Washington QSO Party
Sep 28-29	Late Summer QRP CW Activity Weekend
Oct 5-6	ARRL QSO Party—CW
Oct 12-13	Rio CW DX Contest
Oct 12-13	ARRL QSO Party—Phone
Oct 19-20	ARRL Simulated Emergency Test
Nov 2-3	ARRL Sweepstakes—CW
Nov 16-17	ARRL Sweepstakes—Phone
Dec 7-8	ARRL 160-Meter Contest
Dec 14-15	ARRL 10-Meter Contest

NEWSLETTER OF THE MONTH

Congratulations this month to Editor Hal Gruber W8MGP of *The Mike and Key*, official publication of the Greater Cincinnati Amateur Radio Association (GCARA).

Hal puts together a very interesting newsletter filled not only with club news, but also with features such as hints and kinks, reports on current happenings in amateur radio, and operating tips. Like most successful club publications, *The Mike and Key* includes paid commercial advertising.

Club President Rick Burdick K8WWA and the entire GCARA membership have good reason to feel proud!

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

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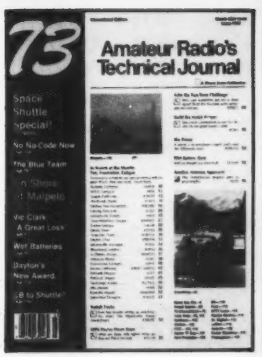

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points are claimed. Each page must be clearly numbered and marked with contestant's call, year, and band to which it refers. All contestants must sign a statement that they have complied with the rules and terms of their license. All logs must be received by the Contest Committee, Radio Society of Bermuda, Box HM275, Hamilton, Bermuda, not later than May 31, 1985. Overseas contestants are recommended to forward their logs via air mail. All decisions of the Contest Committee are final.

YL-ISSB COMMO SYSTEM CW QSO PARTY
Starts: 0001 UTC March 16
Ends: 2359 UTC March 17

Use General portions on HF bands, simplex only on VHF bands, 160 meters through VHF. Individuals needing applications and instruction forms, send a 4 × 9 SASE to Rick and Minnie Connolly KØRDJ/NAØV, Star Route 1, Crocker MO 65452. Send logs, summary sheets, and comments to the same address no later than April 30, 1985.

G-QRP-CLUB SPRING CW ACTIVITY WEEKEND
Daily from 0900 to 2300 UTC
March 16 and 17

All amateur-radio operators interested in QRP are invited to take part in the club's activity. No special exchange information was mentioned in the information provided by the club. The operating schedule for each day is as follows (times are UTC):
0900–1100 14060/21060/28060
1100–1300 3560/7030
1300–1400 10106
1400–1700 14060/21060/28060
1700–1900 3560/7030
1900–2100 14060
2100–2300 3560/7030

Reports should be sent to Fred Garratt G4HOM, 47 Tilshead Close, Druids Heath, Birmingham, B14 5LT, England.

DARC INTERNATIONAL SSTV CONTEST
Starts: 1200 UTC March 16
Ends: 1200 UTC March 17

Use all bands with authorized SSTV subbands. Entry classes include: Class I: shortwave bands; Class II: VHF and UHF bands; Class III: receiving stations. All transmitting categories are single-transmitter only. All contacts shall be worked from one location, and only one callsign shall be used during the contest. The same station can be worked just once per band.

EXCHANGE:

Exchange callsign, signal report, and serial QSO number on video. Only two-way video exchanges count. However, it is explicitly permitted to call CQ SSTV Contest on phone.

SCORING:

Class I and III stations count one point per contact on 80 and 10 meters. Class II and III stations count five points per contact on all VHF and UHF bands. Classes I and III count each contacted continent and each different country according to DXCC and WAE lists on each band for multiplier. Multiply QSO points from all bands operated by multipliers from all bands operated for final score.

For Class II stations, the multipliers are graded as follows: 2m times 2, 70 cm times 4, 23 cm times 6, and 13 cm and higher times 10. In this class, multiply QSO points from each band by its band-related multiplier and add up the results of all bands operated for final score.

AWARDS:

Trophy to top three scorers of each class. Printed certificates to top scorer of each country.

ENTRIES:

Entries must indicate date and time in UTC, callsign of station worked, complete exchange for each valid QSO, and name and address of entrant. Submit separate logs for each band. Multipliers must be clearly marked in the logs. Cross-check list and summary sheet are mandatory. All submitted papers become the property of the DARC. Disqualification for manipulation of results or excessive duplicate QSOs. Results will be published in *CQ-DL*, the DAR Club magazine. Contest logs must be postmarked by May 2, 1985, and addressed to: Heinz Moesti DE8BUS, PO Box 1123, D6473 Gedern 1, West Germany.

KENTUCKY QSO PARTY
2100 UTC March 16
to 0700 UTC March 17
1400 to 2200 UTC March 17

This is the third annual KY QSO Party sponsored by the Western Kentucky DX Association. Stations may work the same station on different bands, modes, or counties. Mobiles compete against mobiles, portables against portables, and fixed against fixed. Portable stations must set up per Field Day antenna rules. Single-transmitter entries only, and single operator for KY fixed stations. Single or multi-operators OK for portable or mobile stations.

EXCHANGE:

RS(T) and state, province, country, or KY county.

FREQUENCIES:

Phone—1840, 3985, 7285, 14285, 21385, 28585; Novice—3725, 7125, 21125, 28125; CW—1815 and approximately 60 kHz from the bottom of each band. KY stations must operate a minimum of 10 minutes for each change of band or mode.

SCORING:

Count 2 points for each 160-meter QSO, phone or CW, 2 points per CW QSO on all other bands, and 1 point per phone QSO on 80, 40, 20, 15, and 10 meters. Combine phone and CW score as one contest.

KY stations multiply QSO points by the sum of the number of states (50), KY counties (120), plus VO and VE1–7 and VY1/VE8 (9). DX stations count only in point totals, not as multipliers. Non-KY stations multiply QSO points by the total number of KY counties worked (120 maximum).

Portable and mobile KY stations add to total score a bonus of 1000 points for each county you operated in outside of your home county. A minimum of 10 contacts must be made in each county to qualify for the bonus.

AWARDS:

Plaques will be awarded to the highest-scoring Novice, Canadian, and DX station, as well as to the high scorer in each state. Participation certificates to all sta-

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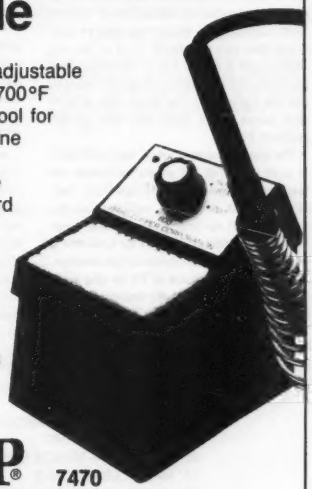

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tions submitting logs with at least 10 contacts.

ENTRIES:

Logs should show date/time in UTC, station worked, band, mode, exchange, and score. Logs must be legible and neat to avoid disqualification. Submit a cross-check sheet (similar to ARRL form CD-77) for each band and mode with over 50 contacts. KY stations must show the counties they worked from as part of their log entry. Logs must be postmarked no later than May 5, 1985, to be eligible for award consideration. Send a large (9 × 12) SASE with $.40 postage to ensure receiving complete contest results plus any awards you may win. No logs will be returned. Entries should be addressed to: Western Kentucky DX Association, William D. Shipe WM4N, Route 1, Adairville KY 42202.

TENNESSEE QSO PARTY
2100 UTC March 23 to 0500 UTC March 24
1400 to 2200 UTC March 24

The fifteenth annual Tennessee QSO Party is sponsored by the Tennessee Council of Amateur Radio Clubs and directed by the Radio Amateurs Transmitting Society of Nashville.

EXCHANGE:

Tennessee stations give a signal report and county; out-of-state stations send a signal report and state, province, or country.

FREQUENCIES:

CW—1815 kHz and about 50 kHz from the bottom of the other HF CW bands; phone—1860, 3960, 7280, 14280, 21380, and 28580 kHz; Novice/Technician—3725, 7125, 21125, and 28125 kHz.

SCORING:

1.5 points per CW contact; 1 point for each phone contact. Combine phone and CW score, unless you wish to compete for phone-only or CW-only awards. Out-of-state stations multiply QSO points by the total number of Tennessee counties worked. Tennessee stations multiply QSO points by the sum of the following: states (50), Tennessee counties (95), and VO and VE1–7 (7). DX stations count only for points—not as multipliers. For portable and mobile operation, add to total score a bonus of 500 points for each county you operated in outside of your home county. A minimum of 10 contacts must be made in each county to qualify for bonus points.

AWARDS:

Plaques will go to the highest-scoring stations in the following categories: Tennessee home, Tennessee mobile, Tennessee portable, and out-of-state. First-place certificates will go to the highest-scoring stations in the following categories: Tennessee phone-only, Tennessee CW-only, Tennessee Novice/Technician, each state, Canada, DX entry, out-of-state Novice/Technician.

ENTRIES:

Logs must contain date/time (UTC), station worked, band, mode, exchange, and score. Logs must be legible to avoid disqualification. Submit cross-check sheets (similar to ARRL Form CD-77) for each band and mode which has over 100 contacts.

Mobiles compete against mobiles, portables against portables. No county-line operation for multiple contacts. Portable stations must set up as per Field Day rules. Single-transmitter entries only are allowed. Repeater contacts are not allowed. No list operation permitted. Contestants may work the same station on different bands, modes, and counties in Tennessee.

Logs must be postmarked no later than May 1, 1985. Send a business-size SASE to ensure return of your log and receipt of results and certificates. Mail to TN QSO, Attn. Jack Byrd KF4VL, PO Box 65, Pleasant View TN 37146.

RIO CW DX PARTY
Starts: 1500 UTC March 30
Ends: 1500 UTC March 31

Sponsored by the Pica-Pau Carioca (Rio Woodpeckers CW Group), PO Box 2673, 20001 Rio de Janeiro, RJ, Brazil, with the cooperation of all other Brazilian CW groups. The purpose is to promote 2-way CW contacts between Brazilian and DX stations, enabling DX stations to obtain QSLs valid for several Brazilian awards. The event is held twice each year on the last full weekend in March and the second full weekend in October.

The general call is "CQ RIO DX PTY." Use all HF amateur bands within your own license authority. Exchange RST, name, and QTH. There are no logs, but quick QSLing (via bureau or direct) is essential.

Reference frequencies are as follows: 3510/3520, 7020/7030, 14030/14050, 21030/21050, 21130/21150, 28030/28050.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

Spring is coming, and in another month or so, it will be time to climb up on that tower and clean up the antenna connections. For now, let's just satisfy ourselves with cleaning up some of the mess around the shack, OK?

One local ham who is trying to do just that by putting a piece of equipment to good use is Fred Wood WB3JKC, from here in Baltimore MD. Fred would like to use a Teletype® Model 35 teleprinter as an output device for his Radio Shack TRS-80 Color Computer®. Well, Fred, you've really got only two problems. First of all, you need to get a signal out of the CoCo that can drive the teleprinter. Then you have to get the signal into the teleprinter at suitable levels. Let's deal with the second problem first.

The signal coming out of the CoCo serial port is at RS-232 levels, whereas the teleprinter expects a "current-loop" signal of 20 mA or 60 mA, switched on for mark and off for space. There have been several schemes published for converting these; you might look back at this column, in the May, 1984, issue of *73* for one such circuit. This is specifically designed for interfacing an RS-232 signal to a Model 33 or Model 35 teleprinter.

As to the CoCo itself, there are two changes that need to be effected before you can print to the port. First, the CoCo comes up with the port set at a speed of 600 baud. This can be changed to the teleprinter's 110 baud with a POKE to the correct memory address. Next, the CoCo is programmed to check for a character-received signal after every character is sent. With a bit of programming, this feature can also be defeated so that you won't have to hard-wire a high signal on the input pin.

The completed program is shown in Fig. 1, and I think you will find that it sends the data out to the serial port just as you like. For those interested, I have also included alternate POKEs for some other popular baud rates (Fig. 3).

Another ham trying to hook up a teleprinter is Emil Kalar W9DXV, from South International Falls MN. Emil asks some basic questions regarding a, you will pardon the expression, RTTY loop. It's been a while since we covered this basic bit of RTTY information. Emil asks:

What is the dc voltage and current used in the signal loop? Teleprinters have been run on voltage levels as low as twelve volts (and maybe lower than that) and as high as three hundred volts. Although the exact voltage is not critical, I guess the average is around one hundred to one hundred fifty volts. The reasons for the higher voltage have to do with the collapse and reestablishment of the magnetic field around the selector magnets during the mark-space and space-mark transitions. The higher the voltage, the quicker the transition, thus, the less chance for errors in decoding. Nonetheless, portable RTTY stations have used twelve-volt batteries as loop supplies. Now, current is another matter. Older RTTY machines, such as the venerable Model 15, were designed to operate on a current loop of 60 mA. Newer ones, such as the Model 33, run on a loop of 20 mA. However, some Model 33s have been set up to run on 60 mA, and that should be printed on the printed circuit card on the right side of the machine. With the 33, when in doubt, assume 20 mA. Since the resistance of the selector magnets is on the order of 100 Ohms or so, this means that at a voltage level of, say, 150 volts, the loop would draw (remembering Ohm's Law) 150 volts divided by 100 Ohms, or 1.5 Amps! Therefore, in order to keep this current in line, a series resistance of 150 volts divided by 0.020 Amps, 7500 Ohms, would be needed. By the way, this needs to be a big resistor, as the dissipation would be 150 volts times 0.020 Amps, or 3 Watts, minimum. Make it at least six Watts to be sure.

```
10 ' 110 BAUD OUTPUT THROUGH
20 ' COCO SERIAL PORT
30 ' RTTY LOOP—MARCH 1985
40 ' MARC I. LEAVEY, M.D.
50 POKE &H95,&H01:POKE &H96,&HF6:' 110 BAUD
60 POKE &HFF23,&H30:' THESE POKES
70 POKE &HFF22,&HF9:' DISABLE THE
80 POKE &HFF23,&H34:' PRINTER HIGH
90 POKE &HFF22,&H00:' SIGNAL REQUIREMENT
```

Fig. 1. CoCo RTTY output program.

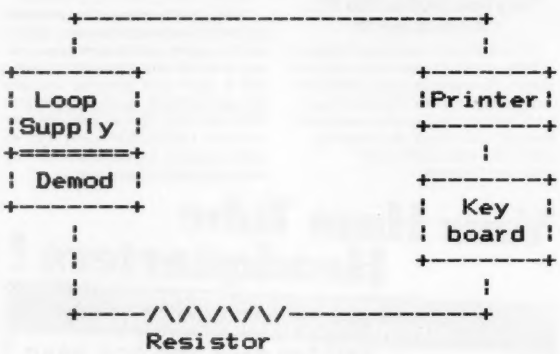

Fig. 2. A simple RTTY loop.

Baud Rate	POKE &H95	POKE &H96
45.45	&H04	&HC7
75	&H02	&HE3
300	&H00	&HB4
1200	&H00	&H28

Fig. 3. Baud rate POKE values.

Is the loop out from TU connected in series with the dc power? The loop, as its name implies, is a series circuit which encompasses the terminal unit, loop supply, printer, keyboard, and whatever accessories are to be keyed by the loop. Since terminal units often include a loop supply, this may not be a separate item. Fig. 2 is a diagram of a very basic RTTY loop.

Does the dc and signal loop connect to terminals 6 and 7? Emil is referencing the "RTTY Loop" column of October, 1984, where a diagram of a Model 33 terminal strip is given. Yes, these two connections would feed the printer.

Is the loop switched to terminals 3 and 4 to send from the 33 keyboard? No. You don't switch the loop, but rather include in it all that is to be included. So, if you wanted the keyboard to be active at all times, echo on the printer, and key the same loop as keys the printer, you would use only terminals 3 and 7, putting the printer and keyboard in series. If, on the other hand, you wanted to separate the keyboard and printer, relying on the receiving device to echo the sent character back to the printer, then you would remove the "common" between terminals 4 and 6 and connect the keyboard to the sending terminals, and the printer to the receiving terminals, of the equipment.

I hope this information is useful and

wish you well in your endeavors. Let me know how things work out.

Regards to George Francis, PhD, W3ASE, in Millersville, Pennsylvania. George wrote me a letter saying that a former student of his is looking to put a vintage 6800 computer onto RTTY and wonders where he could find some programming help. Well, I published several programs for the 6800 here back in June and July of 1977 and 1978. Copies of these have been sent to George, and I recommend them as good references to anyone attempting to write machine-language RTTY programs on a microcomputer.

Speaking of microcomputers, it is time for what has become a monthly question. This month, and I shudder at the response, I would like to hear from all the Commodore owners out there. Tell me what kind of RTTY programming you are using on your VIC-20 or C-64. What do you like about it, and what don't you like about it? How easy, or hard, was it to get on the air? You get the idea. For those who came in late, the past two months have asked about TI-99/4A and Apple II/II+/IIe/IIc computers. The purpose of all this is to try to compile some sort of order out of the chaos of available RTTY programming, which I shall present here when completed. No need to write anything elaborate, a postcard will do quite nicely. And yes, manufacturers are welcome to respond to this survey as well, although I will categorize their responses differently than those of users.

Interest in the "RTTY Loop" reprint series continues unabated. To recap, there are several compiled reprints of information presented years ago in this column. For a list of what is available, send a self-addressed, stamped envelope to me at the above address, requesting the list of reprints available. Of course, I am always happy to hear from you on any RTTY or computer-related topic, and the questions you ask provide me with the sense of direction I take here. Be sure to enclose that self-addressed, *stamped* envelope if you desire a personal reply; otherwise, watch for the answer here, in "RTTY Loop."

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

HOW HAMS VIEW THEMSELVES

It's that time of year again. The temperature is rising, the birds are singing, the sun is shining, and the Fun! Poll has again returned.

This year we mark the poll's fifth anniversary. Since our first survey ran back in 1981, our hobby has experienced a full spectrum of changes, including volunteer licensing, new bands, hams in space, and the advent of microcomputers. The poll, over the years, has kept tabs on these trends and noted the hobby's gradually changing character. We've seen good changes—such as an increase in the ranks of Advanced- and Extra-class licensees—and some disturbing trends—such as the gradual aging of the overall ham population. But, overall, the poll has helped us to understand our hobby a little better.

This year, as in previous Fun! Polls, we're retaining many old questions to track developing trends in our hobby and adding some new ones to keep up with the times. Whatever your views, send your responses to PO Box 73, Middle Village NY 11379. Or, if you've given up on the US Mule, you can transmit your answers electronically. My CompuServe ID is 70007,412 (CIS) or 76004,174 (EIS). My Source ID, if you prefer that system, is TCU335. You may also contact me via MCI Mail; just type my name at the "To:" prompt.

ELEMENT 1
BACKGROUND

1) Sex:
A) Male
B) Female

2) Age:
A) 15 or below
B) 16–21
C) 22–39
D) 40–59
E) 60 or above

3) License class:
A) Novice
B) Technician
C) General
D) Advanced
E) Extra

4) Number of years licensed:
A) 1 year or less
B) 1–5 years
C) 6–10 years
D) 11–20 years
E) 21 years and up

5) Do you have a new (post-March '78) call?
A) Yes
B) No

6) How many hours a week do you devote to amateur radio?
A) 0–1 hour
B) 2–5 hours
C) 6–10 hours
D) 11–20 hours
E) 21 hours or more

7) Which HF band do you use most?
A) 80–75 meters
B) 40 meters
C) 20 meters
D) 15 and/or 10 meters
E) Don't operate HF

8) Which VHF-UHF band do you use most?
A) 6 meters
B) 2 meters
C) 220 MHz
D) 420 MHz and/or up
E) Don't operate VHF-UHF

9) Which mode do you use most?
A) SSB
B) CW
C) FM
D) RTTY
E) Other

10) How much money have you spent on amateur radio within the past year? (Include QSL expenses, magazine subscriptions, club dues, and other incidental expenses.)
A) 0–$250
B) $251–500
C) $501–$1,000
D) $1,001–$2,500
E) $2,501 and up

ELEMENT 2
SOCIAL CHARACTERISTICS

11) On the whole, hams are:
A) too young
B) too old
C) just the right age

12) Do you wear a pocket saver?
A) Yes
B) No

13) Politically, how would you define yourself?
A) Conservative
B) Middle-of-the-road
C) Liberal

14) Should we get rid of the ARRL?
A) Yes
B) No

15) How old were you when you first became a ham?
A) 15 or below
B) 16–21
C) 22–39
D) 40–59
E) 60 or above

16) Should the FCC increase the speeds on amateur CW examinations?
A) Yes
B) No

17) Do you own a home computer?
A) Yes
B) No

18) If you answered "yes" to question 17, which brand?
A) Apple
B) IBM
C) Radio Shack
D) Commodore
E) Other

19) Do you think that home computing is siphoning people (including youngsters) away from amateur radio?
A) Yes
B) No

20) Do you think the volunteer exam system has increased cheating?
A) Yes
B) No

21) Do business interests deserve some of our virtually abandoned bands?
A) Yes
B) No

22) Should ham licenses have a minimum age requirement?
A) Yes
B) No

23) Should ham licenses have a maximum age requirement?
A) Yes
B) No

24) Should hams be subject to periodic retesting?
A) Yes
B) No

ELEMENT 3
OPERATING HABITS

25) If the users were restricted to data communication only (no phone or CW operation), would you be in favor of a no-code 220-MHz Digital-class license?
A) Yes
B) No

RESPONSE FORM

Instructions: Read each question and mark your response by circling the appropriate letter next to the number of the question.

Element 1:
1) A B
2) A B C D E
3) A B C D E
4) A B C D E
5) A B
6) A B C D E
7) A B C D E
8) A B C D E
9) A B C D E
10) A B C D E

Element 2:
11) A B C
12) A B
13) A B C
14) A B
15) A B C D E
16) A B
17) A B
18) A B C D E
19) A B
20) A B
21) A B
22) A B
23) A B
24) A B

Element 3:
25) A B
26) A B
27) A B
28) A B
29) A B
30) A B
31) A B
32) A B
33) A B C D E
34) A B C D E
35) A B
36) A B
37) A B
38) A B
39) A B C D E
40) A B
41) A B
42) A B
43) A B
44) A B
45) A B C D E
46) A B C D E
47) A B C D E
48) A B C D E
49) A B
50) A B

Comments: _____

26) Would you be in favor of a no-code 220-MHz Digital-class ticket if it permitted phone operation in addition to data transmission?
A) Yes
B) No

27) Have you ever used a personal computer in connection with your amateur-radio activities?
A) Yes
B) No

28) Is it time to completely deregulate amateur radio by having the FCC turn over all responsibility for ham operation to the amateur community?
A) Yes
B) No

29) What do you think of people who view pay television services with MDS converters and satellite dishes that are not approved by broadcasters?
A) They're skunks
B) They're within their rights

30) Should we get rid of, or reduce in size, the CW subbands?
A) Yes
B) No

31) Do you think DX nets have a place in ham radio?
A) Yes
B) No

32) Do you think nets in general have a place in ham radio?
A) Yes
B) No

33) The next time a ham operates from space, which band should he/she use?
A) 2 meters
B) 220 MHz
C) 450 MHz
D) An even higher band
E) Shouldn't bother to operate

34) If, while tuning across a band, you heard a net called "Jammers International" in progress, would you:
A) Jam it
B) Ignore it
C) Complain to the FCC or some other organization
D) Listen
E) Join it

35) If required, could you solidly copy CW at the speed at which you were licensed?
A) Yes
B) No

36) If required, could you pass the FCC theory test for your license class?
A) Yes
B) No

37) Have you ever purposely operated in an amateur subband you weren't licensed to use?
A) Yes
B) No

38) Are you fluent in any computer language?
A) Yes
B) No

39) If you answered "yes" to question 38, which language?
A) Basic
B) Pascal
C) Assembler
D) Machine
E) Other

40) Do you feel yourself competent to write a short Basic program?
A) Yes
B) No

41) Do you feel yourself competent to replace the finals in a transistor-type rig?
A) Yes
B) No

42) Do you solder together your own coax connectors?
A) Yes
B) No

43) Is your antenna system mounted on your house or a tower?
A) House
B) Tower

44) Have you ever designed your own antenna?
A) Yes
B) No

45) What do you think of contesting?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

46) What do you think of DXing?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

47) What do you think of repeaters?
A) Great
B) Good
C) Okay
D) Don't like them
E) Despise them

48) What do you think of traffic handling?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

49) If you heard an emergency net in progress, would you immediately join in and offer your services?
A) Yes
B) No

50) Have you ever secretly hoped for a minor disaster to strike your community just so you could demonstrate your radio skills?
A) Yes
B) No

SATELLITES

USING THE AO-10 APOGEE PREDICTIONS

Apogee predictions for the month of March are provided for three sections of the United States: Washington DC at 39N 77W, Kansas at 39N 95W, and California at 38N 122W. Times are in UTC and apogee in this case is mean anomaly 128 rounded to the nearest whole hour. Use the chart as a guide in aiming your antenna, then fine-tune the azimuth and elevation values to peak the satellite's beacon signal. If you require more accurate orbital predictions, contact AMSAT at PO Box 27, Washington DC 20044.

AMSAT-OSCAR 10 APOGEE PREDICTIONS
MARCH 1985

ORBIT	DAY	TIME	WASH AZ	WASH EL	KANSAS AZ	KANSAS EL	CALIF AZ	CALIF EL
1291	1	2000	255	17	241	30	209	48
1293	2	2000	249	18	233	31	199	46
1295	3	1900	241	28	221	40	180	49
1297	4	1800	230	37	206	46	160	49
1299	5	1800	222	37	197	45	154	44
1301	6	1700	208	44	179	48	138	40
1303	7	1600	190	49	160	47	124	33
1305	8	1600	181	46	154	42	122	27
1307	9	1500	163	46	138	38	111	20
1309	10	1400	145	43	124	32	102	11
1311	11	1300	130	37	113	24	94	3
1313	12	1300	127	31	112	18		
1315	13	1200	116	24	102	10		
1317	14	1100	106	16	94	2		
1318	14	2300					260	7
1319	15	1100	105	10				
1320	15	2200					253	17
1321	16	1000	96	2				
1322	16	2200					247	19
1324	17	2100			259	8	238	29
1326	18	2000	264	3	252	17	228	37
1328	19	2000	258	5	245	19	219	38
1330	20	1900	251	15	236	28	205	44
1332	21	1800	243	24	225	37	187	48
1334	22	1800	236	26	217	37	178	45
1336	23	1700	226	34	203	43	160	45
1338	24	1600	213	41	185	47	143	41
1340	25	1600	204	40	177	43	139	35
1342	26	1500	187	44	159	43	126	29
1344	27	1400	169	46	143	39	115	22
1346	28	1400	162	41	139	34	113	16
1348	29	1300	146	38	126	28	104	8
1350	30	1200	132	33	115	20	96	0
1352	31	1100	120	26	106	12		

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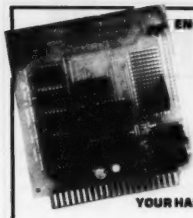

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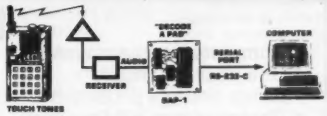

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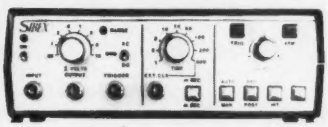

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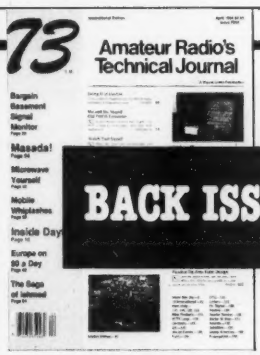

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L. E. Rhodes K8RRB
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Keith Karchner KC9IH
Rte 1 Box 91
Edelstein IL 61526

I need a schematic and a transformer for an Eico model 751 power supply. Also, I need a switch for an Eico 753 transceiver; it's marked "S3D" on the schematic for the tank circuit. Has anyone successfully modified the 753 to eliminate its drift problem?

Patrick Benesch KB4EQJ
PO Box 459
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I need an instruction manual and circuit diagram for a Code-A-Phone 700 telephone answering system. Can anyone help?

M. Garey W6RNE
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Stephen Rehberg N6KZU
322 E. Mayfair Ave.
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I would like the schematic and service or operation manual for the following equipment: model 84-R signal generator manufactured by Measurements Corporation, model 1604 multimeter manufactured by Stark, and model 1606A RF Bridge manufactured by General Radio. I will gladly pay copying and postage charges.

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Computerware has introduced their Manufacturer's Inventory System which is now available for CP/M and MSDOS computer systems. This comprehensive system is specifically designed to meet the special needs of the small- or medium-sized manufacturer.

Going beyond the usual tracking of inventory items and costs, this system includes features like bills-of-materials, parts projections for "what-if" production planning, where-used lists, reorder reports, sales analysis, component shortage reports, and much more. It helps keep a healthy level of inventory—having the right inventory when you need it to keep production flowing without tying up valuable capital in excesses. The projection features are invaluable for planning production and purchasing.

The new visibility provided will increase management's decision-making abilility and help reduce material costs. You will always know what you have on hand, what is on order from your vendors, how much is committed to current production, and the value of your inventory. The system automatically adjusts inventory levels and will recalculate assembly costs with new component prices upon your request. You will be able to recognize fast sellers, slow movers, dead inventory, cyclical sales trends, and components eligible for volume purchases. The system's interactive purchase-order system creates and tracks all purchases, increasing the effectiveness and efficiency of purchasing personnel.

For complete details, contact *Computerware, Box 668, 4403 Manchester Ave. Suite 102, Encinitas CA 92024; (619)-436-3212.* Reader Service number 484.

500K-BYTE MICRO FLOPPY DRIVE

Everett/Charles Marketing Services, Inc., is offering a new 500K-byte, 3½" micro floppy disk drive. The model F353-MFD is a Shugart-compatible, double-density, single-sided disk drive with a formatted capacity of 327.6K bytes employing 80 tracks per inch. Compatible with 5¼" floppy drive controllers, the F353-MFD uses Sony media and a standard IBM format.

The unit is mounted on a compact chassis with a height of 32 mm, a width 104 mm, and a depth of 162 mm and weighs only 600 grams. An ultra-thin hybrid stepping motor is used along with a steel-belt drive system to ensure high precision during head positioning. In the disk tracking mechanism, a highly reliable spindle hub is used which incorporates a direct-drive brushless motor.

The model F353-MFD also features an automatic power-down control. If no commands are sent to the stepping motor during a given period of time, the drive will automatically enter a "power-save" mode.

For further information, contact *Everett/Charles Marketing Services, Inc., 6101 Cherry Ave., Fontana CA 92335; (800)-443-1860.* Reader Service number 476.

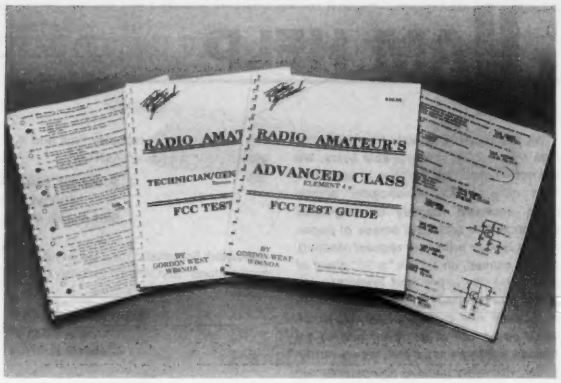
RADIO SCHOOL TEST GUIDES

Gordon West's Radio School has announced the availability of their test guides for every amateur-radio class of license. Originally developed solely for Gordon West's own ham-radio classes in southern California, the test guides have been used by amateur-radio operators throughout the country to successfully pass the new volunteer-administered examinations.

The Radio School test guides list all 500 test questions plus the multiple-choice answers in an 8½" × 11" manual. The exact questions plus the exact distractors (wrong answers) and the exact correct answer are listed as they will be found on ARRL or W5YI volunteer examinations. The General- and Advanced-class test guides list 500 questions, the Extra-class test guide has 400 questions, and the Novice-class test guide covers 200 questions.

Each test guide also lists study notes that reflect reference material on where the questions are derived and where to find out more information about the answers. Formulas for solving the problems are also incorporated in each test guide.

Included in all test guides are several pages of instructions to the applicant on where to locate a Volunteer Exam Coordinator and how to sign up for a local volunteer-administered examination. Also included are the necessary test forms that applicants must fill out ahead of time, including the new FCC Form 610.



New series of FCC test guides by Radio School.

For more information on study guides, code and theory training tapes, and a colorful catalog of amateur-radio instruction material, write *Gordon West's Radio School, 2414 College Drive, Costa Mesa CA 92626; (714)-549-5000.* Reader Service number 479.

RBBS/64 MAILBOX

Computerstuff has announced the release of RBBS/64 amateur-radio mailbox software for Commodore computers.

RBBS/64 is a full-featured radio-bulletin-board program for use with the Commodore 64 and 1541 disk drive. Thirty user commands are available to allow the calling station to create, review, save, and read messages. Advanced capabilities include: automatic logging of user callsign, time and date of access, automatic clock/calendar updates for weeks of unattended use, automatic system shutdown in the event of a component failure, a file-protect option for read-only messages, serial printer support, baud/mode change, expert-user mode, and full directory and storage for up to 100 messages. A break-in mode allows the sysop to modify system parameters, set the Beacon mode, and directly communicate with other stations without stopping the program.

A special configuration program is included which will automatically format and prepare a disk and encode it with the owners call, QTH, and system baud rate (60–132-wpm Murray or 110–1200-baud ASCII), eliminating the need for manually reentering the information each time the system is loaded. A third program included with the RBBS/64 system is a powerful file editor which allows the operator to examine, print, update, edit, or delete messages, convert programs to RBBS/64 format, and view or print the user log.

Detailed information and order forms for RBBS/64 may be obtained by writing to *Computerstuff, 308½ Green St., Yankton SD 57078; (605)-665-2833.* Reader Service number 481.

HOW TO SELL SOFTWARE

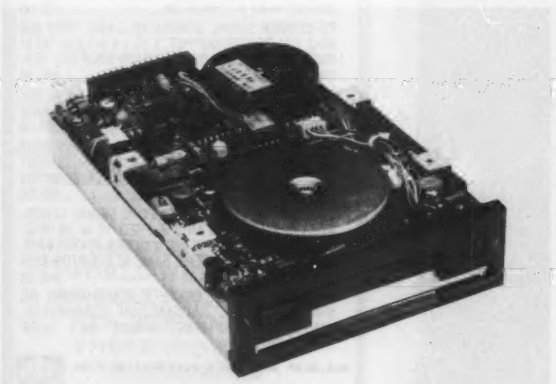
Associated Technology has announced a new book for the success-oriented professional titled, "How to Sell Your Radio Applications Software."

The manual tells how to obtain national directory listings, how to price a new software product, how to locate and qualify a new advertiser, how to write a user's manual, and how to operate a successful mail-order fulfillment service. The manual guides budding entrepreneurs through the maze of problems which can limit the exposure of innovative software products.

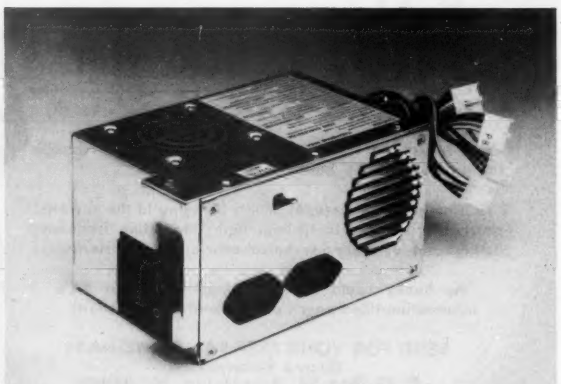
For further details, contact *ATC, Rt. 2 Box 448, Estill Springs TN 37330.* Reader Service number 483.

ADTECH SWITCHING SUPPLIES

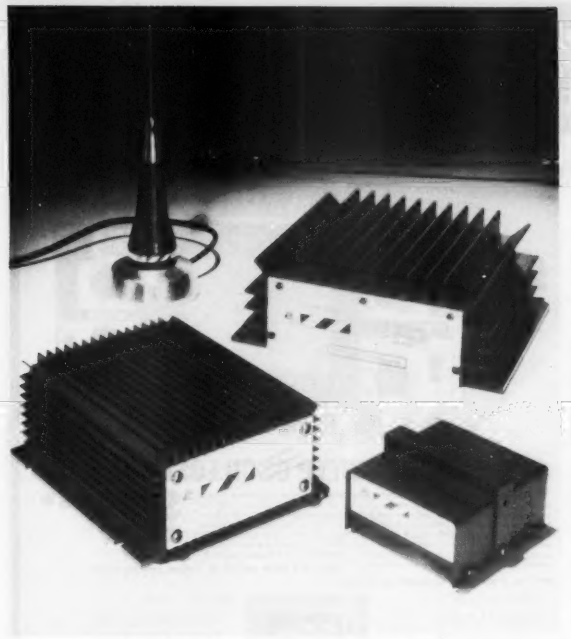
Adtech Power has announced the latest addition to their line of switching power supplies. Model 4KS-150-IBM is a



500K micro floppy drive from Everett/Charles.



Adtech's switching power supply.



Antenna Specialists' line of VHF/UHF amplifiers.

Ten-foot mesh dish from Kaul-Tronics.

fit, form, and function replacement for IBM's PC and XT power supplies.

The 4KS-150-IBM is a four-output, 150-Watt supply that allows PC and XT users to upgrade their computers by taking advantage of the increased power over the 63.5 Watts of the PC and the 130 Watts of the XT. Since the 4KS-150-IBM fits the exact form and has the exact pinout of the less powerful PC and XT supplies, it is a simple matter to add a color-graphics card, hard-disk controller, etc.

For further information, contact *Adtech Sales, 1620 South Sunkist Street, Anaheim CA 92806; (714)-634-9211.* Reader Service number 480.

RF AMPLIFIERS BY ANTENNA SPECIALISTS

The Antenna Specialists Co. has introduced a newly designed, greatly expanded line of rf power amplifiers to accommodate virtually any needed land-mobile application. Twelve new models, from low band through UHF, were introduced simultaneously. A 50-Watt and a 75-Watt unit are available for 35 to 50 MHz, with similar models for mid-band operation. Four amplifiers, ranging from 25 to 100 Watts output power, are available in VHF frequencies from 144 to 174 MHz. An additional four models cover the UHF band from 432 to 512 MHz with output power from 25 to 80 Watts. The new line is offered at prices lower than the company's previous amplifier products, despite engineering improvements leading to greater reliability. A new package design and construction improve heat dissipation while increasing duty cycle.

For complete information and specifications, contact *The Antenna Specialists Co., Marketing Department, 12435 Euclid Ave., Cleveland OH 44106.* Reader Service number 482.

NICAD EXERCISER

Deisenroth Manufacturing has introduced the Nicad Battery Exerciser, a PC board that can be wired into a battery charger. By just pressing a switch, the Exerciser discharges the battery down to 1 volt per cell, then automatically turns on the charger.

Two major nicad problems can be solved by the Exerciser. The Exerciser eliminates excessive cell-capacity loss—caused by overcharging—with a deep discharge. And cell reversal, which occurs when portable radios are left on until the battery is completely discharged, will be prevented.

The Exerciser will work on batteries from 5 volts to 20 volts. Its small dimensions (1¼" × 1¼") and 3 simple connections make installation in most chargers easy.

For further details, contact *Deisenroth Manufacturing, 575 Montgomery Pike, S. Williamsport PA 17701.* Reader Service number 478.

KAUL-TRONICS TVRO ANTENNA

Kaul-Tronics, Inc., has introduced a 10-foot mesh antenna featuring a completely redesigned rib, permitting production-cost savings and a 30-percent price reduction. A patent has been applied for on the rib design.

The antenna package, which includes the Nova polar mount with self-alligning bearings and a buttonhook feed, weighs just 155 pounds and is UPS-shippable anywhere in the US. The new antenna has an f/D ratio of .375.

Engineered for maximum durability and performance by Kaul-Tronics, the Trans-10 features ribs of tubular 16-gauge steel encased in poly-trans vinyl. The ribs have unobstructed mesh-retaining channels for snug positioning.

Other dish components are also heavy duty. It has a 14½" parabolically formed prime steel hub that is 3/16" thick. Its outer rim is made of rigid extruded aluminum and the mesh panels are made of expanded flattened aluminum. The Trans-10 has optional stainless-steel mesh. All antenna hardware is plated for weather protection.

For more information, contact *Kaul-Tronics, Inc., Rte. 2 Box 637, Richland Center WI 53581.* Reader Service number 477.

Hi Pro LB-VHF-UHF Repeaters

Hi Pro TRANSMITTER AND RECEIVER

NOW USED IN ALL HI PRO REPEATERS

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HI PRO TRANSMITTER DESIGNED FOR REPEATER SERVICE WITH EXCELLENT AUDIO, STABILITY, HARMONIC REJECTION AND LOW SIDEBAND NOISE.

ADJUSTABLE POWER OUTPUT UP TO 5 WATTS FROM THE EXCITER BOARD COOL OPERATION

HI PRO RECEIVER THIS RECEIVER IS THE HEART OF THE REPEATER AND BOASTS SUPERIOR SQUELCH ACTION NEEDED FOR THIS TYPE OF SERVICE EXCELLENT SENSITIVITY, STABILITY AND SELECTIVITY

USE THIS RECEIVER TO REPLACE THAT TROUBLESOME RECEIVER IN YOUR PRESENT REPEATER

ASSEMBLED SMALL SIZE 3 7/8 × 6 1/8"

ASK ABOUT OUR NEW COMPUTER CONTROL SYSTEM, AND MICROCONTROL AUTO PATCH, AND REPEATER KITS.

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RAMSEY

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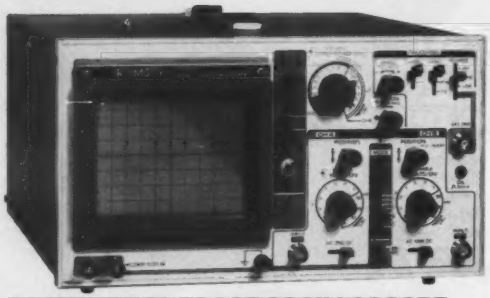
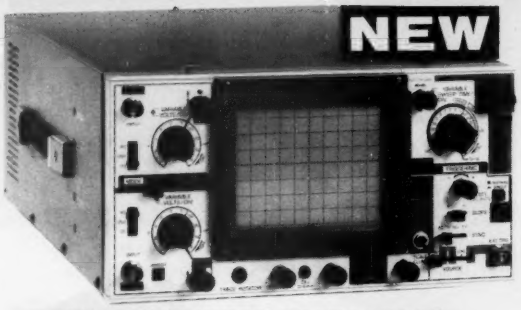


20 MHz DUAL TRACE OSCILLOSCOPE

Unsurpassed quality at an unbeatable price, the Ramsey oscilloscope compares to others costing hundreds more. Features include a component testing circuit for resistor, capacitor, digital circuit and diode testing. • TV video sync filter • wide bandwidth & high sensitivity • internal graticule • front panel trace rotator • Z axis • high sensitivity x-y mode • regulated power supply • built-in calibrator • rock solid triggering • USA—Add $10.00 per unit for postage, overseas orders add 15% of total order for insured Surface Mail

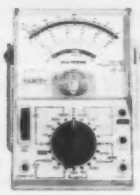
$399.95* high quality hook on probes included



45 MHz DUAL SWEEP OSCILLOSCOPE

The Ramsey 625 is a dual time base, delayed sweep unit that includes a built-in signal delay line to permit clear viewing during very short rise times of high frequency waveforms. Other features include; variable trigger holdoff • 20 calibrated sweep time ranges from 0.5 s/div to 0.2 μS/div. • fully adjustable sweep time • X5 sweep magnification • five trigger sources; CH1, CH2, LINE EXTernal and INTernal (V mode) • front panel x-y operation, Z axis input • sum difference of CH1, and CH2 waveforms displayed as single trace • sweep gate and sweep output • auto focus • single sweep • USA—Add $10.00 per unit for postage, overseas orders add 15% of total order for insured Surface Mail.

$799.95* high quality hook on probes included



RAMSEY D-1100 VOM MULTITESTER

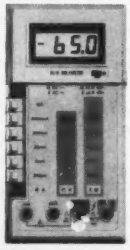
Compact and reliable, designed to service a wide variety of equipment. Features include • mirror back scale • double-jeweled precision moving coil • double overload protection • an ideal low cost unit for the beginner or as a spare back-up unit.

$19.95 test leads and battery included

NEW RAMSEY 1200 VOM MULTITESTER

Check transistors, diodes and LEDs with this professional quality meter. Other features include; decibel scale • 20K volt metering system • 3½" mirrored scale • polarity switch • 20 measuring ranges • safety probes • high impact plastic case

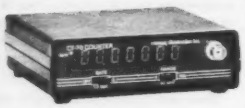
$24.95 test leads and battery included



RAMSEY D-3100 DIGITAL MULTIMETER

Reliable, accurate digital measurements at an amazingly low cost • in-line color coded push buttons, speeds range selection • abs plastic tilt stand • recessed input jacks • overload protection on all ranges • 3½ digit LCD display with auto zero, auto polarity & low BAT. indicator

$49.95 test leads and battery included



CT-70 7 DIGIT 525 MHz COUNTER

Lab quality at a breakthrough price. Features • 3 frequency ranges each with pre amp • dual selectable gate times • gate activity indicator • 50mV @ 150 MHz typical sensitivity • wide frequency range • 1 ppm accuracy

$119.95 wired includes AC adapter

CT-70 kit $99.95
BP-4 nicad pack 8.95

CT-90 9 DIGIT 600 MHz COUNTER

The most versatile for less than $300. Features 3 selectable gate times • 9 digits • gate indicator • display hold • 25mV @ 150 MHz typical sensitivity • 10 MHz timebase for WWV calibration • 1 ppm accuracy

$149.95 wired includes AC adapter

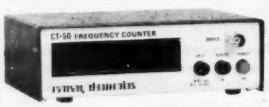
CT-90 kit $129.95
OV-1 0.1 PPM oven timebase 59.95
BP-4 nicad pack 8.95

CT-125 9 DIGIT 1.2 GHz COUNTER

A 9 digit counter that will outperform units costing hundreds more. • gate indicator • 24mV @ 150 MHz typical sensitivity • 9 digit display • 1 ppm accuracy • display hold • dual inputs with preamps

$169.95 wired includes AC adapter

BP-4 nicad pack 8.95



CT-50 8 DIGIT 600 MHz COUNTER

A versatile lab bench counter with optional receive frequency adapter, which turns the CT-50 into a digital readout for most any receiver • 25 mV @ 150 MHz typical sensitivity • 8 digit display • 1 ppm accuracy

$169.95 wired

CT-50 kit $139.95
RA-1 receiver adapter kit 14.95

DM-700 DIGITAL MULTIMETER

Professional quality at a hobbyist price. Features include 26 different ranges and 5 functions • 3½ digit, ½ inch LED display • automatic decimal placement • automatic polarity

$119.95 wired includes AC adapter

DM-700 kit $99.95
MP-1 probe set 4.95

PS-2 AUDIO MULTIPLIER

The PS-2 is handy for high resolution audio resolution measurements, multiplies UP in frequency • great for PL tone measurements • multiplies by 10 or 100 • 0.01 Hz resolution & built-in signal preamp/conditioner

$49.95 wired

PS-2 kit $39.95

PR-2 COUNTER PREAMP

The PR-2 is ideal for measuring weak signals from 10 to 1,000 MHz • flat 25 db gain • BNC connectors • great for shifting RF • ideal receiver/TV preamp

$44.95 wired includes AC adapter

PR-2 kit $34.95

PS-1B 600 MHz PRESCALER

Extends the range of your present counter to 600 MHz • 2 stage preamp • divide by 10 circuitry • sensitivity: 25mV @ 150 MHz • BNC connectors • drives any counter

$59.95 wired includes AC adapter

PS-1B kit $49.95

ACCESSORIES FOR RAMSEY COUNTERS

Telescopic whip antenna—BNC plug	$ 8.95
High impedance probe, light loading	16.95
Low pass probe, audio use	16.95
Direct probe, general purpose use	13.95
Tilt bail, for CT-70, 90, 125	3.95

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TERMS: • satisfaction guaranteed • examine for 10 days; if not pleased, return in original form for refund • add 6% for shipping and insurance to a maximum of $10.00 • overseas add 15% for surface mail • COD add $2.50 (COD in USA only) • orders under $15.00 add $1.50 • NY residents add 7% sales tax • 90 day parts warranty on all kits • 1 year parts & labor warranty on all wired units

RAMSEY

RAMSEY ELECTRONICS, INC.
2575 Baird Rd.
Penfield, N.Y. 14625 ↙ 268

TUBES

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
2C39/7289	$ 34.00	1182/4600A	$500.00	ML7815AL	$ 60.00
2E26	7.95	4600A	500.00	7843	107.00
2K28	200.00	4624	310.00	7854	130.00
3-500Z	102.00	4657	84.00	ML7855KAL	125.00
3-1000Z/8164	400.00	4662	100.00	7984	14.95
3B28/866A	9.50	4665	500.00	8072	84.00
3CX400U7/8961	255.00	4687	P.O.R.	8106	5.00
3CX1000A7/8283	526.00	5675	42.00	8117A	225.00
3CX3000F1/8239	567.00	5721	250.00	8121	110.00
3CW30000H7	1700.00	5768	125.00	8122	110.00
3X2500A3	473.00	5819	119.00	8134	470.00
3X3000F1	567.00	5836	232.50	8156	12.00
4-65A/8165	69.00	5837	232.50	8233	60.00
4-125A/4D21	79.00	5861	140.00	8236	35.00
4-250A/5D22	98.00	5867A	185.00	8295/PL172	500.00
4-400A/8438	98.00	5868/AX9902	270.00	8458	35.00
4-400B/7527	110.00	5876/A	42.00	8462	130.00
4-400C/6775	110.00	5881/6L6	8.00	8505A	95.00
4-1000A/8166	444.00	5893	60.00	8533W	136.00
4CX250B/7203	54.00	5894/A	54.00	8560/A	75.00
4CX250FG/8621	75.00	5894B/8737	54.00	8560AS	100.00
4CX250K/8245	125.00	5946	395.00	8608	38.00
4CX250R/7580W	90.00	6083/AZ9909	95.00	8624	100.00
4CX300A/8167	170.00	6146/6146A	8.50	8637	70.00
4CX350A/8321	110.00	6146B/8298	10.50	8643	83.00
4CX350F/8322	115.00	6146W/7212	17.95	8647	168.00
4CX350FJ/8904	140.00	6156	110.00	8683	95.00
4CX600J/8809	835.00	6159	13.85	8877	465.00
4CX1000A/8168	242.50*	6159B	23.50	8908	13.00
4CX1000A/8168	485.00	6161	325.00	8950	13.00
4CX1500B/8660	555.00	6280	42.50	8930	137.00
4CX5000A/8170	1100.00	6291	180.00	6L6 Metal	25.00
4CX10000D/8171	1255.00	6293	24.00	6L6GC	5.03
4CX15000A/8281	1500.00	6326	P.O.R.	6CA7/EL34	5.38
4CW800F	710.00	6360/A	5.75	6CL6	3.50
4D32	240.00	6399	540.00	6DJ8	2.50
4E27A/5-125B	240.00	6550A	10.00	6DQ5	6.58
4PR60A	200.00	6883B/8032A/8552	10.00	6GF5	5.85
4PR60B	345.00	6897	160.00	6GJ5A	6.20
4PR65A/8187	175.00	6907	79.00	6GK6	6.00
4PR1000A/8189	590.00	6922/6DJ8	5.00	6HB5	6.00
4X150A/7034	60.00	6939	22.00	6HF5	8.73
4X150D/7609	95.00	7094	250.00	6JG6A	6.28
4X250B	45.00	7117	38.50	6JM6	6.00
4X250F	45.00	7203	P.O.R.	6JN6	6.00
4X500A	412.00	7211	100.00	6JS6C	7.25
5CX1500A	660.00	7213	300.00*	6KN6	5.05
KT88	27.50	7214	300.00*	6KD6	8.25
416B	45.00	7271	135.00	6LF6	7.00
416C	62.50	7289/2C39	34.00	6LQ6 G.E.	7.00
572B/T160L	49.95	7325	P.O.R.	6LQ6/6MJ6 Sylvania	9.00
592/3-200A3	211.00	7360	13.50	6ME6	8.90
807	8.50	7377	85.00	12AT7	3.50
811A	15.00	7408	2.50	12AX7	3.00
812A	29.00	7609	95.00	12BY7	5.00
813	50.00	7735	36.00	12JB6A	6.50

NOTE * = USED TUBE

NOTE P.O.R. = PRICE ON REQUEST

"ALL PARTS MAY BE NEW, USED, OR SURPLUS. PARTS MAY BE SUBSTITUTED WITH COMPARABLE PARTS IF WE ARE OUT OF STOCK OF AN ITEM.

NOTICE: ALL PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.

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COLLINS Mechanical Filter #526-9724-010 MODEL F455Z32F

455KHZ at 3.2KHz wide. May be other models but equivalent. May be used or new. $15.99

ATLAS Crystal Filters

5.595-2.7/8/LSB, 5.595-2.7/LSB
8 pole 2.7KHz wide Upper sideband. Impedence 800ohms 15pf In/800ohms 0pf out. 19.99

5.595-2.7/8/U, 5.595-2.7/USB
8 pole 2.7Khz wide Upper sideband. Impedence 800ohms 15pf In/800ohms 0pf out. 19.99

5.595-.500/4, 5.595-.500/4/CW
4 pole 500 cycles wide CW. Impedance 800ohms 15pf In/800ohms 0pf out. 19.99

9.0USB/CW
6 pole 2.7KHz wide at 6dB. Impedance 680ohms 7pf In/300ohms 8pf out. CW-1599Hz 19.99

KOKUSAI ELECTRIC CO. Mechanical Filter #MF-455-ZL/ZU-21H

455KHz at Center Frequency of 453.5KC. Carrier Frequency of 455KHz 2.36KC Bandwidth.
Upper sideband. (ZU) 19.99
Lower sideband. (ZL) 19.99

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CRYSTAL FILTERS

NIKKO	FX-07800C	7.8MHz	$10.00
TEW	FEC-103-2	10.6935MHz	10.00
SDK	SCH-113A	11.2735MHz	10.00
TAMA	TF-31H250	CF 3179.3KHz	19.99
TYCO/CD	001019880	10.7MHz 2pole 15KHz bandwidth	5.00
MOTOROLA	4884863B01	11.7MHz 2pole 15KHz bandwidth	5.00
PTI	5350C	12MHz 2pole 15KHz bandwidth	5.00
PTI	5426C	21.4MHz 2pole 15KHz bandwidth	5.00
PTI	1479	10.7MHz 8pole bandwidth 7.5KHz at 3dB, 5KHz at 6dB	20.00
COMTECH	A10300	45MHz 2pole 15KHz bandwidth	6.00
FRC	ERXF-15700	20.6MHz 36KHz wide	10.00
FILTECH	2131	CF 7.825MHz	10.00

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CERAMIC FILTERS

AXEL	4F449	12.6KC Bandpass Filter 3dB bandwidth 1.6KHz from 11.8-13.4KHz	10.00
CLEVITE	TO-01A	455KHz+-2KHz bandwidth 4-7% at 3dB	5.00
	TCF4-12D36A	455KHz+-1KHz bandwidth 6dB min 12KHz, 60dB max 36KHz	10.00
MURATA	BFB455B	455KHz	2.50
	BFB455L	455KHz	3.50
	CFM455E	455KHz +-5.5KHz at 3dB , +-8KHz at 6dB , +-16KHz at 50dB	6.65
	CFM455D	455KHz +-7KHz at 3dB , +-10KHz at 6dB , +-20KHz at 50dB	6.65
	CFR455E	455KHz +-5.5KHz at 3dB , +-8KHz at 6dB , +-16KHz at 60dB	8.00
	CFU455B	455KHz +-2KHz bandwidth +-15KHz at 6dB, +-30KHz at 40dB	2.90
	CFU455C	455KHz +-2KHz bandwidth +-12.5KHz at 6dB , +-24KHz at 40dB	2.90
	CFU455G	455KHz +-1KHz bandwidth +-4.5KHz at 6dB , +-10KHz at 40dB	2.90
	CFU455H	455KHz +-1KHz bandwidth +-3KHz at 6dB , +-9KHz at 40dB	2.90
	CFU455I	455KHz +-1KHz bandwidth +-2KHz at 6dB , +-6KHz at 40dB	2.90
	CFW455D	455KHz +-10KHz at 6dB , +-20KHz at 40dB	2.90
	CFW455H	455KHz +-3KHz at 6dB , +-9KHz at 40dB	2.90
	SFB455D	455KHz	2.50
	SFD455D	455KHz +-2KHz , 3dB bandwidth 4.5KHz +-1KHz	5.00
	SFE10.7MA	10.7MHz 280KHz +-50KHz at 3dB , 650KHz at 20dB	2.50
	SFE10.7MS	10,7MHz 230KHz +-50KHz at 3dB , 570KHz at 20dB	2.50
	SFG10.7MA	10.7MHz	10.00
NIPPON	LF-B4/CFU455I	455KHz +-1KHz	2.90
	LF-B6/CFU455H	455KHz +-1KHz	2.90
	LF-B8	455KHz	2.90
	LF-C18	455KHz	10.00
TOKIN	CF455A/BFU455K	455KHz +-2KHz	5.00
MATSUSHIRA	EFC-L455K	455KHz	7.00

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2N1562	25.00
2N1692	25.00
2N2857	1.55
2N2857JAN	4.10
2N2857JANTX	4.50
2N2876	13.50
2N2947	18.35
2N2948	13.00
2N2949	15.50
2N3118	5.00
2N3119	4.00
2N3134	1.15
2N3287	4.90
2N3288	4.40
2N3309	4.85
2N3375	17.10
2N3478	2.13
2N3553	1.55
2N3553JAN	2.90
2N3632	15.50
2N3733	11.00
2N3818	5.00
2N3866	1.30
2N3866JAN	2.20
2N3866JANTX	3.80
2N3866JANTXV	4.70
2N3866AJANTXV	5.30
2N3924	3.35
2N3926	16.10
2N3927	17.25
2N3948	1.75
2N3950	25.00
2N3959	3.85
2N4012	11.00
2N4037	2.00
2N4041	14.00
2N4072	1.80
2N4080	4.53
2N4127	21.00
2N4416	2.25
2N4427	1.25
2N4428	1.85
2N4430	11.80
2N4927	3.90
2N4957	3.45
2N4959	2.30
2N5016	18.40
2N5026	15.00
2N5070	18.40
2N5090	13.80
2N5108	3.45
2N5109	1.70
2N5160	3.45
2N5177	21.62
2N5179	1.04
2N5216	56.00
2N5470	75.00
2N5583	3.45
2N5589	9.77
2N5590	10.92
2N5591	13.80
2N5596	99.00
2N5636	12.00
2N5637	15.50
2N5641	12.42
2N5642	14.03
2N5643	25.50
2N5645	13.80
2N5646	20.70
2N5651	11.05
2N5691	18.00
2N5764	27.00
2N5836	3.45
2N5842	8.45
2N5847	19.90
2N5849	20.00
2N5913	3.25
2N5916	36.00
2N5920	$ 70.00
2N5921	80.00
2N5922	10.00
2N5923	25.00
2N5941	23.00
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2N5944	10.35
2N5945	10.00
2N5946	12.00
2N5947	9.20
2N6080	6.00
2N6081	7.00
2N6082	9.00
2N6083	9.50
2N6084	12.00
2N6094	11.00
2N6095	12.00
2N6096	16.10
2N6097	20.70
2N6105	21.00
2N6136	21.85
2N6166	40.24
2N6267	142.00
2N6304	1.50
2N6368	30.00
2N6439	55.31
2N6459	18.00
2N6567	10.06
2N6603	13.50
2N6604	13.50
2N6679	44.00
2N6680	80.00
021-1	15.00
01-80703T4	65.00
35C05	15.00
102-1	28.00
103-1	28.00
103-2	28.00
104P1	18.00
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269-1	18.00
281-1	15.00
282-1	30.00
482	7.50
564-1	25.00
698-3	15.00
703-1	15.00
704	4.00
709-2	11.00
711	4.00
733-2	15.00
798-2	25.00
3421	28.00
3683P1	15.00
3992	25.00
4164P1	15.00
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4340P3	18.00
4387P1	27.50
7104-1	28.00
7249-2	10.50
7283-1	37.50
7536-1	30.00
7794-1	10.50
7795	15.00
7795-1	15.00
7796-1	24.00
7797-1	36.00
40081 RCA	5.00
40279 RCA	10.00
40280 RCA	4.62
40281 RCA	10.00
40282 RCA	20.00
40290 RCA	2.80
40292 RCA	13.05
40294 RCA	2.50
40341 RCA	21.00
40608 RCA	$ 2.48
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62803 RCA	100.00
430414/3990RCA	50.00
3457159 RCA	20.00
3729685-2 RCA	75.00
3729701-2 RCA	50.00
3753883 RCA	50.00
615467-902	25.00
615467-903	40.00
2SC568	2.50
2SC703	36.00
2SC756A	7.50
2SC781	2.80
2SC1018	1.00
2SC1042	24.00
2SC1070	2.50
2SC1216	2.50
2SC1239	2.50
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2SC1307	5.50
2SC1424	2.80
2SC1600	5.00
2SC1678	2.00
2SC1729	32.40
2SC1760	1.50
2SC1909	4.00
2SC1945	10.00
2SC1946	40.00
2SC1947	10.00
2SC1970	2.50
2SC1974	4.00
2SC2166	5.50
2SC2237	32.00
2SC2695	47.00
A2X1698	POR
A3-12	14.45
A50-12	24.00
A209	10.00
A283	6.00
A283B	6.00
A1610	19.00
AF102	2.50
AFY12	2.50
AR7115	20.00
AT41435-5	6.35
B2-8Z	10.70
B3-12	10.85
B12-12	15.70
BAL0204125	152.95
BF25-35	56.25
B40-12	19.25
B70-12	55.00
BF272A	2.50
BFQ85	2.50
BFR21	2.50
BFR90	1.00
BFR91	1.65
BFR99	2.50
BFT12	2.50
BFW16A	2.50
BFW17	2.50
BFW92	1.50
BFX44	2.50
BFX48	2.50
BFX65	2.50
BFX84	2.50
BFX85	2.50
BFX86	2.50
BFX89	1.00
BFY11	2.50
BFY18	2.50
BFY19	2.50
BFY39	2.50
BFY90	$ 1.50
BLW60C5	15.00
BLX67	12.25
BLX67C3	12.25
BLX93C3	22.21
BLY87A	7.50
BLY88C3	13.08
BLY89C	13.00
BLY90	45.00
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DXL1003P70	22.00
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HP35826E	32.00
HP35831E	30.00
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HP35859E	75.00
HP35866E	44.00
HXTR2101	44.00
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HXTR5101	31.00
HXTR6104	68.00
HXTR6105	31.00
HXTR6106	33.00
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JO2000	10.00
JO2001	25.00
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M1131	5.15	MRF464	25.30	NE021350	5.30	SD1009-2	15.00
M1132	7.25	MRF466	18.97	NE13783	61.00	SD1012	10.00
M1134	13.40	MRF472	1.50	NE21889	43.00	SD1012-3	10.00
M9116	29.10	MRF475	3.10	NE57835	5.70	SD1012-5	10.00
M9579	6.00	MRF476	3.16	NE64360ER-A	100.00	SD1013	10.00
M9580	7.95	MRF477	20.00	NE64480 (B)	94.00	SD1013-3	10.00
M9587	7.00	MRF479	8.05	NE73436	2.50	SD1013-7	10.00
M9588	5.20	MRF492	23.00	NE77362ER	100.00	SD1016	15.00
M9622	5.95	MRF502	1.04	NE98260ER	100.00	SD1016-5	15.00
M9623	7.95	MRF503	6.00	PRT8637	25.00	SD1018-4	13.00
M9624	9.95	MRF504	7.00	PT3127A	5.00	SD1018-6	13.00
M9625	15.95	MRF509	5.00	PT3127B	5.00	SD1018-7	13.00
M9630	14.00	MRF511	10.69	PT3127C	20.00	SD1018-15	13.00
M9740	27.90	MRF515	2.00	PT3127D	20.00	SD1020-5	10.00
M9741	27.90	MRF517	2.00	PT3127E	20.00	SD1028	15.00
M9755	16.00	MRF525	3.45	PT3190	20.00	SD1030	12.00
M9780	5.50	MRF559	1.76	PT3194	20.00	SD1030-2	12.00
M9827	11.00	MRF587	11.00	PT3195	20.00	SD1040	5.00
M9848	35.00	MRF605	20.00	PT3537	7.80	SD1040-2	20.00
M9850	13.50	MRF618	25.00	PT4166E	20.00	SD1040-4	10.00
M9851	20.00	MRF626	12.00	PT4176D	25.00	SD1040-6	5.00
M9860	8.25	MRF628	8.65	PT4186B	5.00	SD1043	12.00
M9887	2.80	MRF629	3.45	PT4209	25.00	SD1043-1	10.00
M9908	6.95	MRF641	25.30	PT4209C/5645	25.00	SD1045	3.75
M9965	12.00	MRF644	27.60	PT4556	24.60	SD1049-1	2.00
MM1500	25.00	MRF646	29.90	PT4570	7.50	SD1053	4.00
MM1550	10.00	MRF648	33.35	PT4577	20.00	SD1057	10.00
MM1552	50.00	MRF816	15.00	PT4590	5.00	SD1065	4.75
MM1553	50.00	MRF823	20.00	PT4612	20.00	SD1068	15.00
MM1607	8.45	MRF846	44.85	PT4628	20.00	SD1074-2	18.00
MM1614	10.00	MRF892	35.50	PT4640	20.00	SD1074-4	28.00
MM1810	15.00	MRF894	46.00	PT4642	20.00	SD1074-5	28.00
MM1810	15.00	MRF901 3 Lead	1.00	PT5632	4.70	SD1076	18.50
MM1943	1.80	MRF901 4 Lead	2.00	PT5749	25.00	SD1077	4.00
MM2608	5.00	MRF902/2N6603JAN	15.00	PT6612	25.00	SD1077-4	4.00
MM3375A	17.10	MRF902B	18.40	PT6619	20.00	SD1077-6	4.00
MM4429	10.00	MRF904	2.30	PT6708	25.00	SD1078-6	24.00
MM8000	1.15	MRF905	2.55	PT6709	25.00	SD1080-7	7.50
MM8006	2.30	MRF911	2.50	PT6720	25.00	SD1080-8	6.00
MM8011	25.00	MRF965	2.55	PT8510	15.00	SD1080-9	3.00
MPSU31	1.01	MRF966	3.55	PT8524	25.00	SD1084	8.00
MRA2023-1.5	42.50	MRF1000MA	32.77	PT8609	25.00	SD1087	15.00
MRF134	10.50	MRF1004M	31.05	PT8633	25.00	SD1088	22.00
MRF136	16.00	MRF2001	41.74	PT8639	25.00	SD1088-8	22.00
MRF171	35.00	MRF2005	54.97	PT8659	25.00	SD1089-5	15.00
MRF208	11.50	MRF5176	24.00	PT8679	25.00	SD1090	15.00
MRF212	16.10	MRF8004	2.10	PT8708	20.00	SD1094	15.00
MRF221	10.00	MSC1720-12	225.00	PT8709	20.00	SD1095	15.00
MRF223	13.00	MSC1821-3	125.00	PT8727	29.00	SD1098-1	30.00
MRF224	13.50	MSC1821-10	225.00	PT8731	25.00	SD1100	5.00
MRF227	3.45	MSC2001	30.00	PT8742	19.10	SD1109	18.00
MRF230	2.00	MSC2010	93.00	PT8787	25.00	SD1115-2	7.50
MRF231	10.00	MSC2223-10	245.00	PT8828	25.00	SD1115-3	7.50
MRF232	12.07	MSC2302	POR	PT9700	25.00	SD1115-7	2.10
MRF237	3.15	MSC3000	35.00	PT9702	25.00	SD1116	5.00
MRF238	13.80	MSC3001	38.00	PT9783	16.50	SD1118	22.00
MRF239	17.25	MSC72002	POR	PT9784	32.70	SD1119	5.00
MRF245	35.65	MSC73001	POR	PT9790	56.00	SD1124	50.00
MRF247	31.00	MSC80064	35.00	PT31083	20.00	SD1132-1	15.00
MRF304	36.00	MSC80091	10.00	PT31962	20.00	SD1132-4	12.00
MRF306	50.00	MSC80099	3.00	PTX6680	20.00	SD1133	9.50
MRF313	11.15	MSC80593	POR	RE3754	25.00	SD1133-1	10.00
MRF314	29.21	MSC80758	POR	RE3789	25.00	SD1134-1	2.50
MRF315	28.86	MSC82001	33.00	RF35	16.00	SD1134-4	12.00
MRF316	55.43	MSC82014	33.00	RF85	17.50	SD1134-17	12.00
MRF317	63.94	MSC82020M	130.00	RF110	21.00	SD1135	10.25
MRF412	18.00	MSC82030	33.00	S50-12	23.80	SD1135-3	12.00
MRF420	20.12	MSC83001	40.00	S3006	15.00	SD1136	12.50
MRF421	25.00	MSC83003	82.00	S3007	10.00	SD1136-2	12.50
MRF422	38.00	MSC83005	70.00	S3031	22.00	SD1143-1	10.00
MRF427	17.25	MSC83026	POR	SCA3522	5.00	SD1143-3	17.00
MRF428	63.00	MSC83303	POR	SCA3523	5.00	SD1144	4.00
MRF433	12.07	MSC84900	60.00	SD345	5.00	SD1145-5	15.00
MRF449/A	12.65	MT4150	14.40	SD445	5.00	SD1146	15.00
MRF450/A	14.37	MT5126	25.00	SD1004	15.00	SD1147	15.00
MRF452/A	17.00	MT5596(2N)	99.00	SD1007	15.00	SD1188	10.00
MRF453/A	18.40	MT5768(2N)	95.00	SD1007-2	15.00	SD1189	24.00
MRF454/A	20.12	MT8762	25.00	SD1007-4	15.00	SD1200	1.50
MRF455/A	16.00	NE02136	2.00	SD1007-5	15.00	SD1201-2	15.00

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SD1202	$10.00	SD1304-8	$ 2.50	SD1451-2	$15.00	SRF1427	$50.00	SD1246H12	25.00	SD1410-8	21.00	SD1536-1	41.00	SRF2917	15.00
SD1212-8	4.95	SD1305	3.00	SD1452	20.00	SRF1431	40.00	SD1262	15.00	SD1413-1	18.00	SD1539H	100.00	SRF2918	15.00
SD1212-11	4.95	SD1307	3.00	SD1452-4	24.00	SRF1834	40.00	SD1263	15.00	SD1416	28.00	SD1542H1	170.00	SRF2919	15.00
SD1212-16	4.95	SD1308	3.00	SD1453H1	20.00	SRF2053-3	60.00	SD1263-1	15.00	SD1422-2	24.00	SD1544	26.00	SRF3071FF	50.00
SD1214-7	5.00	SD1311	1.00	SD1454-1	48.00	SRF2092	50.00	SD1272	10.95	SD1428	24.00	SD1545	33.00	SS4006	25.00
SD1214-11	5.00	SD1317	8.00	SD1477	35.00	SRF2147	22.00	SD1272-1	10.95	SD1428- 6084	12.00	SD1546H1	55.00	SS4152	15.00
SD1216	12.00	SD1319	2.50	SD1478	21.00	SRF2225	15.00	SD1272-2	10.95	SD1429-2	15.00	SD1561	79.00	TA7686	15.00
SD1219-4	15.00	SD1345-6	5.00	SD1480	53.00	SRF2264	25.00	SD1272-4	10.95	SD1429-3	14.90	SD1574-1	6.95	TA8559	15.00
SD1219-5	15.00	SD1347-1	1.00	SD1484	1.50	SRF2265	100.00	SD1278	13.75	SD1429-5	15.00	SD1575	6.95	TA8561	15.00
SD1219-8	15.00	SD1365-1	2.50	SD1484-5	1.50	SRF2281	5.00	SD1278-1	13.75	SD1430	12.00	SF4557	25.00	TA8562	15.00
SD1220	8.00	SD1365-5	2.50	SD1484-6	1.50	SRF2371	15.00	SD1278-5	13.75	SD1430-2	18.00	SK3048	5.00	TA8563	15.00
SD1220-1	9.50	SD1375	7.50	SD1484-7	1.50	SRF2347	50.00	SD1279-1	18.00	SD1434	28.00	SL501-59	15.00	TA8564	15.00
SD1220-9	8.00	SD1375-6	7.50	SD1488	22.85	SRF2356	38.00	SD1279-3	18.00	SD1434-5	28.00	SL501-173	15.00	TA8896	15.00
SD1222-8	16.00	SD1379	15.00	SD1488-1	28.00	SRF2378	16.00	SD1281-2	8.00	SD1434-9	28.00	SM7714	5.00	TI5189	3.55
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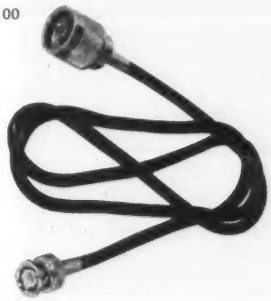

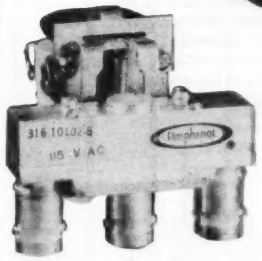

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- ☐ 2. Purchase within 6 months
- ☐ 3. Brand comparisons
- ☐ 4. Reference
- ☐ 5. Other

B. How many projects from 73 have you built within the last year?
- ☐ 1. None
- ☐ 2. 1–2
- ☐ 3. 3–4
- ☐ 4. 5 or more

C. What is your most useful source of information about the equipment you buy?
- ☐ 1. Magazine review
- ☐ 2. New product announcement
- ☐ 3. Manufacturer's brochure
- ☐ 4. Dealer's advertisement

D. Which of the following 73 features do you read regularly?
- ☐ 1. Never Say Die
- ☐ 2. 73 International
- ☐ 3. New Products
- ☐ 4. Review
- ☐ 5. RTTY Loop
- ☐ 6. Fun!
- ☐ 7. Contests
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- ☐ 9. Awards
- ☐ 10. QRX...
- ☐ 11. Satellites
- ☐ 12. Propagation
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- ☐ 14. Letters

E. If you own a Commodore 64 or VIC 20 computer do you read any of the following magazines regularly?
- ☐ 1. RUN
- ☐ 2. Compute!'s Gazette
- ☐ 3. Compute!
- ☐ 4. Ahoy
- ☐ 5. Family Computing

F. If you own a TRS-80 computer, do you read any of the following magazines regularly?
- ☐ 1. 80 Micro
- ☐ 2. HOT CoCo
- ☐ 3. Rainbow

G. If you own an Apple computer, do you read any of the following magazines regularly?
- ☐ 1. InCider
- ☐ 2. A+
- ☐ 3. Nibble
- ☐ 4. Call A.P.P.L.E.

H. Do you:
- ☐ 1. Read 73 only
- ☐ 2. Read other amateur radio magazines as well

I. Which of the following microcomputers do you use in the hamshack?
- ☐ 1. Apple
- ☐ 2. VIC-20
- ☐ 3. Commodore 64
- ☐ 4. TRS-80 Color Computer
- ☐ 5. Other TRS-80 Models
- ☐ 6. Timex/Sinclair
- ☐ 7. CP/M-based

J. What type of information would you like to see in 73? (Pick 3)
- ☐ 1. Construction—gadgets
- ☐ 2. Construction—complex projects
- ☐ 3. Computer interfacing/RTTY
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- ☐ 5. Electronics tutorials
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April 1984
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May 1984
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June 1984
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July 1984
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August 1984
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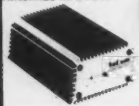

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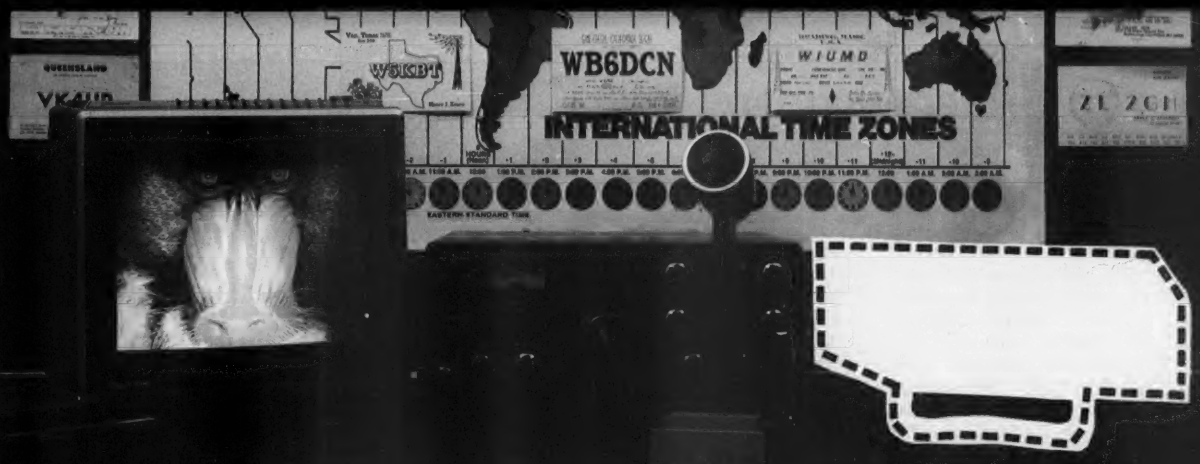

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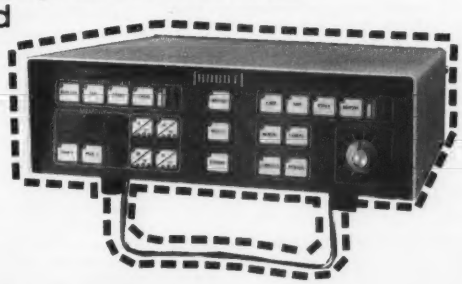

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73 INTERNATIONAL

Each month, 73 brings you ham-radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73 Magazine, Pine Street, Peterborough NH 03458, USA, Attn: Perry Donham KW1O.

AUSTRALIA

J. E. Joyce VK3YJ
44 Wren Street
Altona 3018
Victoria
Australia

After sending out some twenty-five letters to Division and Club Secretaries throughout Australia over the last twelve months, asking for information for this column, I was disappointed, to say the least, at receiving only five replies of which only two gave any information of use to this column.

The following letter from Diana Main VK6KYL, secretary of the Goldfields Amateur Radio Group, shows how a small dedicated group of amateurs can assist the local community and, in turn, be assisted by that same community. There should be more of this type of community involvement in amateur radio as it can only benefit our hobby in the future.

A HISTORY OF THE GOLDFIELDS AMATEUR RADIO GROUP (Western Australia)

Originally known as the Kalgoorlie Repeater Group, the inaugural meeting was held on the 14th June, 1977, and the group was formed to maintain the previously established 2m repeater—VK6RAK—which was, and still is, located at the Hainault Gold Mine. The original office bearers were Lewis VK6ZGO, president, Doug VK6OR, secretary, and Tony VK6BV, treasurer. The decision to affiliate with the Western Australia Repeater Group was the first item on the agenda. There were approximately 10 members at this time, which was 100% of the amateur population.

The group was inactive between July, 1978, and June, 1981, due to work transfers. In June, 1981, the group was reformed, and the name was changed to the Goldfields Amateur Radio Group. The Kalgoorlie Repeater Group ceased to exist. The introduction of the Novice license resulted in an influx of new amateurs and a broadening spectrum of interests.

The office bearers at this time included two of the original group. Lewis VK6ZGO was reelected president and Bruce VK6ZKB, treasurer, and a relatively new amateur, Diana VK6KYL, was elected secretary.

1981 was a busy year for the group. The first inkling of a new repeater at Kambalda emerged with the growing awareness of the increased tourist traffic in the Eastern Goldfields. At this time, the now aging beacon began to misbehave. The unit has proven to be unreliable and was taken off the air pending redesign or replacement when the time and funds are available. JOTA, 1981, saw the full complement of Scout and Guide groups in the area having a total of 5 stations operated by members of the group.

GARG, in October, 1984. Left to right: front row—Herb VK6KHC, Phil W60370 (SWL), Diane VK6KYL, Noel VK6ZAK; center row—Jim VK6ZMR, Warren (SWL), Martin (SWL), Bill VK6ZX, Roy VK6ET; back row—Rob VK6ZMB and Peter VK6PK.

July, 1982, saw a difference of opinion with the local newspaper and a clarification over the misuse of the word ham, which resulted in a half-page article on the group and amateur radio with accompanying photographs. During this period, the idea for a local award was put forward. Members endorsed the idea wholeheartedly, and the name Hainault's Reward was chosen. In the forthcoming months, this idea was borne to fruition. Representatives of the group attended the A.G.M. of the Kalgoorlie "Boulder Tourist Bureau" to present our proposal for an award exemplifying the attractions of the Goldfields. A subtle suggestion for monetary assistance was made and proved more than successful. We now have one of the most sought-after local certificates available in Australia. Details of our certificate are included to whet your appetite.

Hainault's Reward

From the Goldfields Amateur Radio Group of Western Australia. This award is available to all licensed amateurs and SWLs. All contacts made on or after January 1st, 1982, are valid.

Requirements: (a) VK/ZL—Work 5 resident Goldfields amateurs, including 2 GARG members within the 250-km radius of Kalgoorlie. This includes the town of Windarra. (b) Overseas—Work 3 resident Goldfields amateurs, including 1 GARG member within the 250-km radius of Kalgoorlie. This includes the town of Windarra. (c) *Any one contact with the club station, VK6AGF,* is an instant qualifier for the award.

Cost: (a) VK/ZL—$3.00 (Australian) or equivalent, or 8 IRCs; (b) Overseas—$4.00 (Australian) or equivalent, or 10 IRCs.

Application: QSLs are not needed, but a certified extract of your log signed by 2 other amateurs is necessary. Send your application to: The Award Manager, PO Box 463, Kalgoorlie, Western Australia, 6430.

All contacts to be made in accordance with the applicant's license requirements. No official GARG net contacts count. Contacts to be 2-way SSB, CW, FM, or other recognized mode of transmission, no crossmode or crossband contacts except via satellite. All contacts endorsed mobile or portable to be made from the same call area.

1983 was a vintage year. VK6AGF (Australian Gold Fields) became a reality and the group commenced having its monthly meetings in the Theatrette at the Hainault Gold Mine. Our unqualified thanks to Ian Moffatt, the owner of the mine (and now inaugural life member of the Tourist Bureau), for his complete support and cooperation in the establishment of the original repeater, the award, and permanent meeting place.

VK6AGF was first activated at the annual Community Fair where we manned the Tourist Bureau stand and publicized the Goldfields on air and amateur radio to the general public. Fund-raising became a priority and the group made an exceptional effort to accomplish its aim of financial independence. Methods used included a battery drive and club T-shirts screenprinted with the club logo, courtesy of Gina, the wife of Barry VK6NBM (now VK6KIT). Our major money-raising effort was a weekend litter drive around the Kambalda (Western Mining) mine lease. The total monies raised from this effort alone exceeded $400! Safety and security communications have been provided on some occasions for the local motorcycle club.

The Kambalda 2m repeater (VK6RKB) is now close to being fully operational. The first site chosen was a hill overlooking the town of Kambalda where Western Mining had recently vacated a tower and radio hut. Unfortunately, this was later resumed by the company for exploration purposes. Nevertheless, this was a blessing in disguise, as the company then said we could choose any site we liked. Naturally, we looked for a high spot. The ideal site stood out like a sore thumb, or to be more precise, a 30m (100 ft.) disused drilling rig.

Power was the next problem. We noticed that the local TV translator, which was close by, had 3-phase power connected to it. With due disregard for the realities of life, we proceeded to write a letter to Western Mining requesting their cooperation in the erection and supply of single-phase power to the site. We were duly surprised and elated to discover that our request had been complied with and not only at no initial cost to us, but also all future power would be free.

VK6RKB Kambalda. The repeater is in the "thunderbox."

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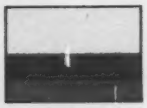
Is this the only repeater in the world to be housed in a thunderbox 30 meters above the ground? (To the uninitiated, a thunderbox is an outdoor toilet.)

The membership today includes satellite enthusiasts VK6ZMR and VK6ZMB, slow-scan from VK6ET, AMTOR from VK6PK and VK6ZX, low-band DX from VK6AS and VK6ZX, computing from VK6AKO, VK6NWS, and others, and, until recently, VK6ACF was our aeronautical medic (Royal Flying Doctor Service).

At present, the Goldfields boasts approximately 30 licensed Amateurs of whom about one third take an active interest in the group's activities.

POINT OF INTEREST

The West Australians (VK6) are now driving around with car number plates stating "W.A.—The Home of the America's Cup."



COLOMBIA

Abelardo (Lalo) Santos V. HK3EQJ
PO Box 88937
Bogota 8
Colombia

NATIONAL VACCINATION CRUSADE

"A first step for Colombia, for its children, a giant step for children everywhere," said James P. Grant, UNICEF Executive Director.

The first of three massive national vaccination journeys in Colombia, with repercussions all over the world, took place June 23 (the second on July 28 and the third of this special health program on August 25, 1984).

This extraordinary event (with the economic help of UNICEF, WHO/PAHO, and UNDP) was organized by the Colombian Health Ministry based on a decision taken only on April 18 of this year. One can easily imagine the efforts made by all involved in order to meet the goals within the given dates. Eight hundred thousand Colombian children below four years old were immunized against five deadly diseases, namely, diptheria, polio, tetanus, pertussis, and measles.

To be present for the second vaccination journey, James P. Grant, the UNICEF executive director, came to Bogota the 27th of July. On arrival at El Dorado Airport, he commented to the world press waiting for his arrival: "The eyes of many around the world are on Colombia this summer—for example, 18 health experts from Upper Volta arrived here yesterday to observe your experience in Colombia." (Teams of observers from Ecuador, El Salvador, Haiti, and the Dominican Republic also were present.)

"In many ways, if you are as successful on the second and third of these national immunization days as the first, it is equal in importance to the first step that was taken on the moon, 15 years ago. You will remember when that first astronaut went to the moon, when he took his first step. This immunization program in Colombia is a first step for Colombia, for its children, a giant step for children everywhere."

The Colombian Radio Amateur League was requested by the Bogota D.E. Health Authorities to provide essential radio communications for the vaccination team covering the most needy, poverty-ridden inhabitants of the southwestern part of the capital city, where not even public telephones exist.

The Emergency Operations Committee of the LCRA was entrusted with this task, and its coordination was assigned to Armando Vargas HK3DPG, who gathered some forty volunteer colleagues provided with 2-meter hand-helds for mobile operation and two base stations, one manned by Oliverio HK3COG and Atanacio HK3BBJ (located at the Santa Clara Hospital) and the second by Lalo HK3EQJ, at the Boss Municipal Hospital.

Teams of doctors plus one coordinator (Dr. Hans Nalhaus) were visiting from 0700 to 1700 all the vaccination posts in the wide area, providing advice, keeping the vaccine stocks replenished, supervising the statistical work, and, of course, giving the food and soft-drinks logistic support for everybody involved in the operation.

The 7390 Bogota District LCRA repeater was permanently manned and extremely busy during the whole day on the vaccination journeys. Spare sets and replacement batteries were provided on demand, and rotation of the operators took place without any difficulties.

Previous day meetings were held at the LCRA Headquarters and last-minute instructions were exchanged under the coordinator's scrutiny and in the light of suggestions made by the health authority's liaison officer, Dr. Jaime Rosas—who was so pleased and impressed with the radio amateurs' effective and smooth performance that he decided to become an amateur himself.

Dalia HK3JI also was there, working with the coordinator, and was immediately contacted by all the team communications officers (including Humberto HK3DHM, Alberto HK3FXE, German HK3HDT, and Gilberto HK3GRB when two boxes of sandwiches mysteriously disappeared precisely at the lunch time, and calm was returned to the hungry crowd when Jaime HK3GWM and Carlos HK3BFU relayed the orders given by the Supply Officer whereby chicken and hamburgers would replace the lost rations.

The action went on and on all over the country; problems were unavoidable but promptly solved when the news was given to the proper authorities. An almost lost village in the jungles of Choco Province did not have any vaccination shots for its children due to not having received the supplies sent from Bogota. Well, the Colombian President, Mr. Belisario Betancourt himself, ordered his personal helicopter to be immediately rushed to the spot.

The order was so hastily executed that when the team had landed with the vaccine and therefore the mission was accomplished—oops!! The pilot noticed that there was not enough fuel for the return flight. For this, a second flight was organized and the problem solved.

For the third vaccination journey, there were six hundred thousand more polio vaccine doses needed; the Argentine government came to the rescue, and their Health Ministry proceeded to air-ship the badly needed vaccine.

For the three vaccination dates, alphabetization teams from exclusive Northern Bogota's schools were assigned to help as vaccination assistants. The meeting place at dawn was at The Heroes Monument Square, with a short stopover at Santa Clara's Hospital for final instructions and delivery of health supplies entrusted to them. The transport arrangements were made for specially-hired intermunicipal buses. One of the drivers from the Boyaca Province was not at all familiar with the Bogota daredevil driving habits; he was stranded with his precious 50 pupil passengers and everybody at Santa Clara was panic stricken. After an extremely long hour of waiting, he finally showed up with a wide smile, saying: "Sorry, I missed a turning!"

CYPRUS

Aris Kaponides 5B4JE
PO Box 1723
Limassol
Cyprus

With the coming of autumn and winter, quite a few Cyprus amateurs, both 5B4s and ZC4s, have been active on any band which had reasonable propagation. Some Cypriot amateurs are very active on RTTY, usually during the afternoons on 20m. On RTTY can be heard 5B4MC, 5B4IT, 5B4MD, 5B4OP, 5B4NG, 5B4CV, 5B4EP, and very soon 5B4OJ, 5B4OV, and 5B4JE hopefully will be also active on this mode with home-brew interfaces and terminal units.

Very recently a group of amateurs from the southern part of Cyprus formed a net on 28.500 MHz which meets on Mondays, Wednesdays, and Saturdays at 1800 UTC. The net was named by OM Andy ZC4HA the "Aphrodite Net," Cyprus having been known in ancient times as the birthplace of Aphrodite, goddess of love. On the net come up regularly Andy 5B4DN, Lucas 5B4BS, Nicos 5B4CV, Aris 5B4JE, and from the ZC4 side, Andy ZC4HA, Allan ZC4AB, and Jim ZC4JE. The whole group will welcome any breakers when the band opens from any part of the world. All the stations are equipped with beams, most of them home-brew, and if the band will open for the winter period we are sure that old Aphrodite will put up a fine show.

At the end of September we had the annual International Rothmanns Cyprus Rally. Many drivers from many countries took part, and the friends of this sport were focused on Cyprus for three days. Every year Cyprus radio amateurs help with the communications, using 2m, providing a very efficient service. The fellow in charge for the rally communications was Chris 5B4EI, a broadcast engineer, who did an excellent job.

The club stations in Cyprus are operated once a week, and more members and friends are using them. The Limassol club obtained recently an FT-757GX transceiver by Yaesu, almost half-price through Telectronics Communications, Ltd., in Limassol, and all club members would like to thank them for their most generous gesture. We do hope that other firms will follow their example. Club stations in small places like Cyprus need all the help they can get.

Another repeater was activated in October. This is a UHF repeater set up on Troodos mountain, and it covers most of the island. Neighboring countries should also be able to open it during summertime on tropo. It receives on 434.6 MHz and transmits on 439.6 MHz. Cyprus now has four VHF repeaters, R2, R4, R5, and R6 and the recent UHF one. Lots of visitors as well as local amateurs are keeping them very busy.

Christmas is coming soon—as I write this—and most of the amateurs and their friends will meet in Nicosia at their annual Christmas dance. New friendships and new acquaintances will be made and everybody will have an excellent time, thus showing amateur radio at its best.

FEDERAL REPUBLIC OF GERMANY

Hans J. Schalk DJ8BT
Hammarskjold-Ring 174
D 6000 Frankfurt 50
Federal Republic of Germany

Up to now the facsimile mode in the Amateur Radio Service could be of little use. This is due to a small supply of those facsimile (FAX) machines and unreasonable prices. In the past two years, however, amateurs were able to obtain several surplus Telecopy machines. This situation caused an increased activity on all amateur bands.

Presently, there are over 30 FAX stations from eight European countries (DL, EA, F, G, HB, LA, LX, and OE) QRV and active on the shortwave bands. After the weekly *FAX Bulletins* or on the activity day (Wednesday 1600 to 2000 UTC), the FAX friends meet together on 80 or 20 meters. The *FAX Bulletin* schedules are Saturday, 1600 UTC, 3600 kHz, and Sunday, 0900 UTC, 14100 kHz (beaming USA).

Additionally, the *FAX Bulletin* is transmitted on VHF and UHF in several regions of the Federal Republic of Germany. Transmissions contain the DL broadcast from DARC (Deutscher Amateur Radio Club) and the actual weather forecast chart (by DL5EJ) as well as the *FAX Bulletin* by DJ8BT. The *FAX Bulletin* is published monthly and contains news from the

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Microlog Corp. has many different digital communication systems for commercial, maritime, military as well as amateur radio service. We were the first to advertise an AMTOR terminal and we are one of the few ham radio manufacturers to supply "SITOR" equipment for the critical Maritime Telex System.

In testing various available AMTOR programs, we have found in some of them a very low tolerance for bit-rate timing error. Some programs "bomb" on as little as 2 parts in 10000 (0.02%) timing difference which is possible with computer crystal variations. This indicates an inability to adequately perform "bit synchronization"* in their decoding algorithms. This is totally apart from the necessary master/slave timing lock in AMTOR and operates to "fine tune" the individual 10 millisecond bit timing. In a non-synchronous code such as Baudot or ASCII, this bit sync occurs naturally with each stop bit. But with the synchronous ARQ code as used in AMTOR, which has no start/stop bit, a very sophisticated decoding algorithm is required so that minor timing differences between two terminals can be quickly compensated for. Without this, synchronous code operation is eventually lost as the two clocks "lose" each other. Our new high sample rate "bit sync" AMTOR algorithm can follow timing errors far in excess of expected system clock variations. It is of course, compatible with all known SITOR/AMTOR protocols and will allow operation with systems previously impossible because of clock deviations. This tracking is fully automatic and does not require typing control commands to manually alter system timing as required in some programs.

If you own an Air-1 with AMTOR, we will supply you with an updated set of "high rate bit sync AMTOR+" ROMS plus as a bonus, a disk which contains the real-time disk communicator and ASCII Tokenizer programs for sending programs over the air. Just send in your present ROMS (two 2764's with their labels intact) and $35. We'll rush you the new ones.

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*A digital communications technique of continually adjusting an internal clock to match the received signal's bit rate.

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↵ See List of Advertisers on page 80

scene of facsimile as it is used by radio amateurs.

Once in the year, on the third weekend in October, an international FAX contest takes place. One purpose of this contest is the testing of one's own station and operational abilities under difficult conditions. The FAX contest is sponsored by the DARC and was a great success last year. The D-F-D award (Deutsches FAX Diplom), sponsored by the GARTG (German Amateur Radio Teleprinter Group), is also supporting these activities.

A FAX QSO can be established on the shortwave bands as an independent mode of operation. For arrangements of transmissions, occasionally the SSB mode will be used. On the shortwave bands, FAX traffic takes place on 3600 kHz, 7040 kHz, 14100 kHz, 21150 kHz, and 28200 kHz, plus/minus 5-kHz variation.

Transmissions will be handled in F1C/F3C respective J2C/J3C with a shift from 400 Hz. According to CCITT (Committee Consultative International Telegraphique et Telephonique) recommendation T16, white in HF position should be the higher frequency. Depending on the volume of transmitted messages (small or large pixels), the bandwidth varies from 1500 up to 3000 Hz.

The Amateur Radio Service uses, as do commercial radio services, a drum speed of 120 rpm, corresponding to 120 lines per minute. All transmissions will be operated with an IOC (Index of Cooperation) of 288 and/or 264. The transmission of a message upon a 13" standard page size takes almost 10 minutes.

As a rule, a CQ call will be helpful prior to the start of a FAX QSO. For this purpose, each FAX station has created his own special CQ card. This card contains the request for a QSO, references for linearity and aperture distortion, as well as other information concerning the transmitting station. (An ATV test chart is comparable.)

To reduce the transmitting time, the CQ card should use a smaller format then any standard pages. If the CQ call is successful, a short personal introduction will be given. For this purpose, the name and the QTH are already prepared on a chart, ready for transmission. On all charts the own call and the call of the QSO partner are reported. Any ID in another mode is, according to DVO (operation directives for the Amateur Radio Service Laws in DL), not necessary.

However, a CW ID will be very useful to notify other hams that an amateur-radio transmission is taking place. All other arrangements regarding the transmission of cards, pictures, schematics, or photos will be in FAX mode, using only a marker pencil and a piece of paper. For "QSL direct" this is the ultimate mode!

Depending on its bandwidth, facsimile is an operating mode which is relatively susceptible to disturbances. This means documents with a high resolution (small size pixels) require a channel free of disturbance for a fault-free transmission. Since at the start of a FAX transmission a synchronization (phasing in) between the machines is being established, short disturbances don't influence the contents of the whole transmission too much. With QRM, however, the transmission of high-resolution documents must be dropped.

Each FAXer holds an assortment of marker pencils with various line thicknesses to adjust the transmission conditions. For example, a callsign which is written with a line thickness of 5 mm or more comes through the highest QRM with proper reading. With selection of a slower drum speed than 120 rpm and an IOC of 576, disturbances also can be bypassed.

A FAX QSO is a very attractive matter. A communication frequently takes longer than an hour. While waiting patiently for the next picture, there is also time for minor repairs or any improvements to the station.

EUROPA FAKSIMILE DIPLOMA, "EU-FAX-D"

The Deutscher Amateur Radio Club (DARC) issues the "Europa Faksimile Diploma (EU-FAX-D)" to promote amateur FAX activities. The award is available to all radio amateurs, club stations, and SWLs. It is based on two-way FAX contacts with different European countries and their prefixes.

1. The EU-FAX-D will be issued in 3 classes: EU-FAX-D 3, EU-FAX-D 2, and EU-FAX-D 1.

2. EU-FAX-D 3: Written confirmations (QSL or FAX prints) from at least 5 different countries (regardless of the band used) and a minimum of 10 prefix points are required. (a) The European countries are determined by the European countries list (WAE list), see below. (b) Each official European prefix counts for one prefix point per each band.

EU-FAX-D 2: 20 prefix points in 10 countries.

EU-FAX-D 1: 40 prefix points in 20 countries.

3. All amateur bands where FAX as a mode of communication is permitted (including VHF) may be used. Only two-way FAX contacts are valid.

4. All QSLs must confirm "two-way FAX" (Faksimile). QSLs shall be dated on or after January, 1980. Any altered or forged confirmation will result in disqualification of the applicant.

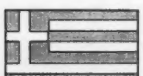
5. FAX contacts during the "DARC-FAX Contest" can be used for EU-FAX-D endorsements, provided the log of the requested station has also been received. Therefore, claims should not be made before the publication of the annual contest results. Requests must be stated within two years after the respective contest.

6. The fees for each certificate are DM 10 or 15 IRCs.

7. Send both a list confirmed by your official radio club and the fees to: DARC FAX Manager, Hans-Juergen Schalk DJ8BT, Hammarskjoeld-Ring 174, D 6000 Frankfurt 50, Federal Republic of Germany.

WAE Countries List

C31, CT1, CT2, DL, EA, EA6, EI, F, FC, G, GD, GI, GJ, GM, GM Shetland, GU, GW, HA, HB, HB0, HV, I, IS, IT, JW Bear, JW Spitsbergen, JX, LA, LX LZ, OE OH, OH0, OJ0, OK, ON, OY, OZ, PA, SM, SP, SV, SV5 Rhodes, SV9 Crete, SV Athos, T77/M1, TA European part, TF, UA1346, UA2, UA Franz Josefs Land, UB, UC, UN/UK1N, UO, UP, UQ, UR, Y22-99/DM, YO, YU, ZA, ZB2, 1A0, 3A, 4U1 Geneva, 4U1 Vienna, 9H1.



GREECE

Manos Darkadakis SV1IW
Box 23051
Athens 11210
Greece

As you probably don't know (but you can take my word for it), Greece has a tradition with respect to VHF and UHF activities taking place in this part of Europe. For some years now, quite a few SV amateurs have supported the European VHF Contest during the first weekend of September. This contest is organized by DARC and offers an excellent opportunity to all VHF enthusiasts to meet again with the challenge of long-distance communications on the high frequencies. The only problem with this kind of contest is that the normal QTH isn't any good; you have to choose another one!

With that in mind, five SV amateurs decided to participate in this year's contest and they chose a location promising good traffic, a spot on a mountain in the northeast part of Peloponnese, 1700 meters above sea level, some 200 km west of Athens (European QTH-locator LY 15 B). So, on the afternoon of August 31, SV1DC, SV1JG, SV1PL, SV1RC, and SV1RL headed up to the new QTH.

Now, since this is not a detailed description of their trip and stay there, I'm going to point out only a few interesting things about this mini-DXpedition. The equipment they carried was an ICOM IC-271, a Yaesu FT-480R, and a Mirage B-1016 P.A. There was also a generator to power up the radios through Yaesu's FP-107 power supply. Antennas were a 19 el and a 9 el made by F9FT. The propagation was not at its best, but within the 24-hour period of the contest they managed to work quite a few stations in every part of Greece and in Bulgaria, Yugoslavia, and Italy.

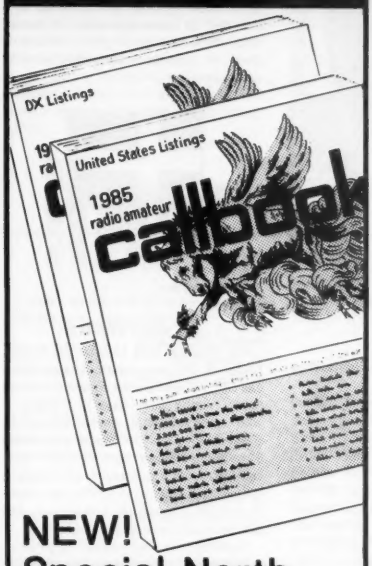
Some interesting experiments also were carried out on UHF, where contact with Athens was possible even with 100 milliwatts and a rubber ducky from their side. I also would like to mention a test between the preamplifier fitted into the IC-271 and the one inside the B-1016. Though ICOM's preamplifier utilizes a GaAsFET transistor and Mirage's a JFET type, the difference between the two is surprisingly big. The signal-to-noise ratio in weak-signal reception was rather annoying when ICOM's preamp was switched on, and it did not help at all. On the contrary, when the Mirage preamp was switched on, a great improvement in signal-to-noise ratio was obvious, which in effect pulled the weak ones out of the noise. So, hats off to Mirage...

Finally, the team would like to pay a tribute to SV1RC, who was responsible for the food supplies. Spyros at his best loaded his car with 45 steaks and 72 cans of beer. He was responsible for cooking, serving, etc., and he also made sure that the team consumed everything. After the DXpedition was over, the team elected

Left to right: SV1RL, SV1DC, SV1PL, and SV1RC.

The QTH in "Steakland."

1985 CALLBOOKS



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Spyros as the king of the new country—named "Steakland." They even intended to send paperwork to ARRL for approval of Steakland as a new DXCC country. What do you think of that?

GREAT BRITAIN

Jeff Maynard G4EJA
10 Churchfields
Widnes WA8 9RP
Cheshire
England

THE UK SCENE

For some time now, European VHF enthusiasts have used a QTH locator system called QRA as a ready means of identifying their station position. It is based on a grid system that arbitrarily divides Europe into a series of major squares.

Each major square is identified by a pair of letters from the horizontal and vertical axis. Each major square is subdivided into one hundred minor squares. Each minor square is further subdivided into 9 final squares. A particular QTH is identified by reference to the final square in which it resides.

My own QTH in Widnes can be identified as QRA YN 47b which locates it to within a few hundred meters. The QRA system has become very popular for two reasons.

First, it enables a ready computation of the distance between any two given stations. Given a QRA locator during a QSO, and knowing your own QRA, it is easy to calculate the direct distance between the stations using a home computer or calculator. Since most VHF/UHF contests award points based on distance worked, this is clearly most useful.

Second, a number of awards are based on "squares worked." In all cases these refer to the major squares. Since some of these contain large areas of sea or little population, it is not easy to collect the quantity required. DXpeditions regularly advertise their impending activation of particularly rare or desirable squares.

The system has worked well for many years. Unfortunately, it suffers from a particular disadvantage. This is that it cannot be extended on a worldwide basis. Indeed, it has proved difficult to extend the system into East Europe as VHF distances worked have increased.

A new system is to be used with effect from 1st January 1985. This is applicable worldwide and, therefore, overcomes the major limitation of the original QRA system. The new locator has a degree of compatibility with QRA from which existing references can be translated. Of particular importance to award hunters is the ready transcription of major squares from one system to the other. The hunter with only one square to collect for a particular wall decoration will not have to start again (much to his relief, I guess).

The new system is based on the division of the world into fields. Each field covers 20° of longitude and 100° of latitude. This gives a total of 324 fields, labeled AA through RR.

Each field is subdivided into 100 squares, 1° in latitude and 2° in longitude, and numbered 00 through 99. Incidentally, each of these squares coincides with a major square of the old QRA system. Hence the basic compatibility (although the nomenclature is quite different—my own YN square is now known as IO83).

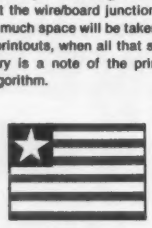
The squares are finally subdivided into a 24 × 24 grid of subsquares, each of 5' longitude by 2.5' of latitude. The subsquares are labeled AA through XX. A full locator is therefore of the form IN79DC.

King Hussein JY1 and Rune SM0COP.

To enable individuals to calculate their new locator readily, the RSGB has produced a locator map for $2.00. This covers only Western Europe, but the instructions for determining a locator reference are given in no fewer than 17 languages. Clearly, somebody thinks the system will find wide acceptance!

A recent sign of the times is the introduction in the Radio Society of Great Britain's magazine, *Radio Communication*, of a computing column. I think this is basically a good idea. I am very much in favor of expanding general awareness and knowledge of computing (which is my own professional discipline).

However, I do find that some of the programming examples are so simple as to be tedious. It's like a constructional article including comments that components be soldered by introducing a hot iron and solder at the wire/board junction. I worry that too much space will be taken up with coding printouts, when all that should be necessary is a note of the principle or basic algorithm.



LIBERIA

Brother Donard Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of the Holy Cross
St. Patrick High School
PO Box 1005
Monrovia
Republic of Liberia

AMATEUR RADIO IN LIBERIA

The Liberia Radio Amateur Association may locate its headquarters in one of the Liberia Telecommunications buildings. That would be somewhat like an American amateur-radio club setting up in an FCC building. In the States, such a move might develop severe complications because of the multitude of amateur clubs. Here in Liberia, we have only one.

Half a dozen years ago, our amateur association was well situated in the Justice Building, at a very convenient location near the center of the city. I was not in Liberia at that time, but I am told that they had a sizeable room with adequate furniture and an operational amateur station with its TA-33 on the roof. The transceiver was an HW-101.

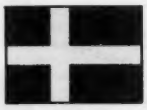
With the change in government, the amateurs lost access to those facilities and to date have not been relocated. The new government did tolerate amateur activities and to my knowledge there was no time when those privileges were denied. For a period of about a year, however, no new calls were issued and no one was quite sure of the future. Over the years the amateurs of Liberia have behaved themselves and have observed the law, and I think that it was in view of this fact that the new government saw fit to allow continued amateur-radio operation.

In any case, life has gone on, and since the association has not been able to find a place to reestablish its headquarters, it has had to hold its meetings wherever space and facilities could be found. Many of the meetings were held in one of the recreation rooms at the Firestone Rubber Plantation, forty miles out of town. Some meetings were held in private homes, and at least one was held at the social center of the American Embassy. The Liberia Radio Amateur Association was fortunate to be in the hands of strong and capable leadership during those difficult times, and it has not only held its own but has gained strength. Right now we have seventy-five amateurs in Liberia (plus or minus a few). In Tappita City, we have six students who are ready for their tests in Morse code and radio theory, and in Buchanan we have a class of 31 in progress. All this time we have been without a central location from which to operate, but now it is possible that within a year we will be given the use of a room in one of the telecom buildings.

The Telecommunications people maintain classroom facilities in order to prepare candidates to work for them. At the present time, they are in the process of relocating their classrooms and the rooms presently in use will be vacated. The building in which these classrooms are located is an ideal site for an amateur-radio headquarters. As one might expect, the space that is becoming available is in great demand, but there is a good chance that the amateurs will get the use of one of the rooms.

During this period of time, the association has retained its call letters, EL2RL. The HW-101 and the TA-33 are still functional. Both have been farmed out for use until such time as we find a new place for them.

An added note of interest: The rainy season wound down to an end October/November, having washed our antennas with 196.5 inches of rain. These gleaming antennas had not served us well for three months. Communication was very poor, probably the fault of the ionosphere. Then signal strength improved. As the dry season came in (with no rain at all), the harmatan would blow in, coat the antennas with dust and, for those of us along the ocean, also a little salt. This kind of conditioning does not contribute to well-functioning antennas!



SWEDEN

Rune Wande SM0COP
Frejavagen 10
S-150 22 Nykvarn
Sweden

JY1 VISITS SWEDEN

His Majesty, King Hussein of Jordan, holder of the well-known amateur-radio call JY1, visited Sweden, together with his family, during three days in October. It was a private visit on invitation by Swedish King Carl XI Gustaf and Queen Silvia. King Hussein also met with representatives for the Swedish government, visited Saab-Scania in Linkoping, manufacturer of automobiles and aircraft, and did some sight-seeing in Stockholm.

Knowing that King Hussein is genuinely interested in ham radio, Ulf SM5BBC and I tried to reach him in the Royal Palace in Stockholm in order to arrange for a greeting from the Swedish hams. Ulf had previously been in contact with JY2RZ, Prince Raad, who together with his Swedish wife also was on this trip. On Friday night, the day before the Royal Family returned to Amman, we were invited to see them in the Royal Palace for what turned out to be a very pleasant and informal meeting among hams. During the hour and a half Ulf, Stig SM0CWC, Ake SM4EAC, and I met with King Hussein, Prince Raad, and Ali JY3AK. We found that our experiences from the DX bands were very much the same. On the question why JY was so rare now compared to a few years ago, the King jokingly told Prince Raad to close down the Amman 2-meter FM repeater for some time when they returned home.

The King had a QSO with Erik SM0AGD on one of the local Stockholm repeaters using Ulf's call as "second operator" JY1/SM5BBC.

Before we left, the charming Queen Noor JY1NH returned from her shopping tour and joined us. She confirmed that although the King has much too little time for ham radio, he really tries to get on the air as often as he has the chance to.

WARC BANDS NOW OPENED

Sweden, together with neighboring Finland and the USSR, has been among the very few countries that have not authorized the WARC bands for amateur use. Early 1984 we got the word from the National Swedish Telecommunication Administration that during the CEPT conference in Madrid, Spain, in April, they were going to ask participating nations about

Frequency kHz	Mode	Power Input	Class of License
10,100–10,150	A1A	150 W	A and B
18,068–18,168	A1A	150 W	A and B
24,890–24,990	A1A	150 W	A and B
24,890–24,990	A1A	100 W	C

Fig. 1.

their experience on the new WARC bands. In October, 1984 we finally got the long-desired information that as of December 1, 1984, the 10-, 18-, and 24-MHz amateur bands would open for Swedish radio amateurs (see Fig. 1).

In accordance with the restrictions put on the Swedish hams on the 160m band, also on these new bands, the following have to be complied with:

- amateur traffic is permitted on a secondary non-interfering basis
- amateurs are required to listen on the frequency before and during transmissions in order not to interfere with priority traffic
- participation in contests on the WARC bands is not permitted
- permission to use the WARC bands can be withdrawn with immediate effect if objections are filed

We are extremely happy being allowed to join the many amateurs already on these new bands. Although the tough winter weather was upon us, I am sure that very many Swedish hams planned to be out there working on WARC band antenna projects. By the time you read this, you certainly have worked many SM stations on these interesting bands, and I hope to meet you there too.

HAM HELP

I need a diagram for a Sansui model 400 AM/FM stereo. Can anyone help?

M. McDaniel W6FGE
940 Temple St.
San Diego CA 92106

Would someone please help me find a manual for a Hammarlund HQ-170 receiver? I will gladly pay any costs incurred.

Fred Wood WB3JKC
1020 West Lanvale St.
Baltimore MD 21217

Can anyone provide assistance or information in converting the HyGain 3750 to using the 6146 tube?

Also, I desperately need a 19-kHz crystal for the RCA stereo FM signal simulator model WR-52A. I will pay any reasonable price for the information.

Connie Mercer NG4C
403 Pershing Drive
WSMR NM 88002

I am looking for technical data, especially the schematic, covering a Meditron model 302 electromyograph, manufactured by Meditron, a division of Crescent Engineering and Research Co., El Monte CA, which is apparently out of business. I will gladly pay for copying expense and postage. Any MDs out there that can help?

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Norwalk CA 90650

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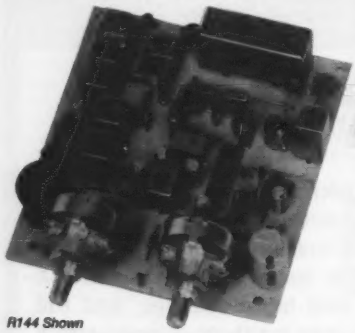

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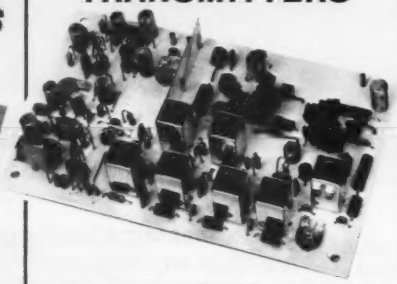

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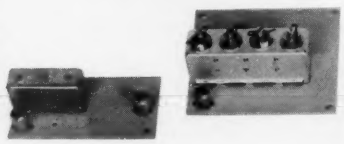

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- **CWID KITS** 158 bits, field programmable, clean audio, rugged TTL logic. Kit only $68.
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- **AUTOPATCH KITS.** Provide repeater autopatch, reverse patch, phone line remote control of repeater, secondary control via repeater receiver. Many other features. Only $90. Requires DTMF Module.
- **NEW – SIMPLEX AUTOPATCH** Use with any transceiver. System includes DTMF & Autopatch modules above and new Timing module to provide simplex autopatch and reverse autopatch. Complete patch system only $200/kit. Call or write for details.

hamtronics®

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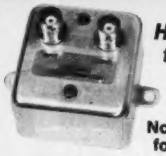

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No Need to Pay $80 to $125 for a GaAs FET Preamp.

FEATURES:

- Very Low Noise: 0.7 dB VHF, 0.8 dB UHF
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- Latest Dual-gate GaAs FET, Stable Over Wide Range of Conditions
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MODEL	TUNES RANGE	PRICE
LNG-28	26-30 MHz	$49
LNG-50	46-56 MHz	$49
LNG-144	137-150 MHz	$49
LNG-220	210-230 MHz	$49
LNG-432	400-470 MHz	$49
LNG-40	30-46 MHz	$64
LNG-160	150-172 MHz	$64

ECONOMY PREAMPS

Our traditional preamps, proven in years of service. Over 20,000 in use throughout the world. Tuneable over narrow range. Specify exact freq. band needed. Gain 16-20 dB. NF = 2 dB or less. VHF units available 27 to 300 MHz. UHF units available 300 to 650 MHz.

- P30K, VHF Kit less case $18
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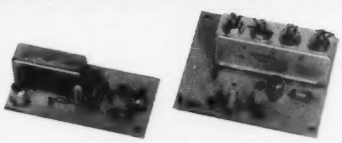
- P432K, UHF Kit less case $21
- P432W, UHF Wired/Tested $36

HELICAL RESONATOR PREAMPS



Our lab has developed a new line of low-noise receiver preamps with helical resonator filters built in. The combination of a low noise amplifier and the sharp selectivity of a 3 or 4 section helical resonator provides increased sensitivity while reducing intermod and cross-band interference in critical applications. See selectivity curves at right. Gain = approx.12 dB.

Model	Tuning Range	Price
HRA-144	143-150 MHz	$49
HRA-220	213-233 MHz	$49
HRA-432	420-450 MHz	$59
HRA-( )	150-174MHz	$69
HRA-( )	450-470 MHz	$79

Models to cover every practical rf & if range to listen to SSB, FM, ATV, etc. NF = 2 dB or less.

	Antenna Input Range	Receiver Output
VHF MODELS	28-32	144-148
	50-52	28-30
Kit with Case $49	50-54	144-148
Less Case $39	144-146	28-30
Wired $69	145-147	28-30
	144-144.4	27-27.4
	146-148	28-30
	144-148	50-54
	220-222	28-30
	220-224	144-148
	222-226	144-148
	220-224	50-54
	222-224	28-30
UHF MODELS	432-434	28-30
	435-437	28-30
Kit with Case $59	432-436	144-148
Less Case $49	432-436	50-54
Wired $75	439.25	61.25

SCANNER CONVERTERS Copy 72-76, 135-144, 240-270, 400-420, or 806-894 MHz bands on any scanner. Wired/tested Only $88.

SAVE A BUNDLE ON VHF FM TRANSCEIVERS!

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Cabinet Kit, complete with speaker, knobs, connectors, hardware. Only $60.

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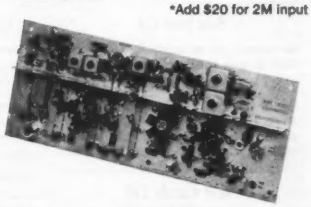
For SSB, CW, ATV, FM, etc. Why pay big bucks for a multi mode rig for each band? Can be linked with receive converters for transceive. 2 Watts output vhf, 1 Watt uhf.

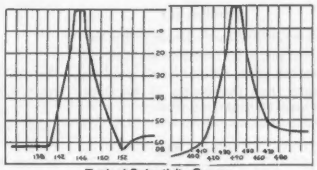
	Exciter Input Range	Antenna Output
For VHF,	28-30	144-146
Model XV2	28-29	145-146
Kit $79	28-30	50-52
Wired $149	27-27.4	144-144.4
(Specify band)	28-30	220-222*
	50-54	220-224
	144-146	50-52
	50-54	144-148
	144-146	28-30
For UHF,	28-30	432-434
Model XV4	28-30	435-437
Kit $99	50-54	432-436
Wired $169	61.25	439.25
	144-148	432-436*

*Add $20 for 2M input



VHF & UHF LINEAR AMPLIFIERS. Use with above. Power levels from 10 to 45 Watts. Several models, kits from $78.

LOOK AT THESE ATTRACTIVE CURVES!



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PROPAGATION

Jim Gray W1XU
73 Staff

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA	20	20						15	15	15	15	15
AUSTRALIA						40	20	20			15	15
CANAL ZONE	20	40	40	40	40		20	15	15	15	15	20
ENGLAND	40	40	40				20	20	20	20		
HAWAII		20			40	40	20	20				15
INDIA							20	20				
JAPAN							20	20				
MEXICO		40	40	40	40		20	15	15	15	15	
PHILIPPINES							20	20				
PUERTO RICO		40	40	40	40		20	15	15	15	15	
SOUTH AFRICA									15	15	15	
U. S. S. R.							20	20				
WEST COAST			80	80	40	40	40	20	20	20		

CENTRAL UNITED STATES TO:

ALASKA	20	20					15					
ARGENTINA										15	15	15
AUSTRALIA	15	20				40	20	20				15
CANAL ZONE	20	20	40	40	40	40			15	15	15	20
ENGLAND		40	40					20	20	20	20	
HAWAII	15	20	20	20	40	40	40					15
INDIA								20	20			
JAPAN								20	20			
MEXICO	20	20	40	40	40	40			15	15	15	20
PHILIPPINES								20	20			
PUERTO RICO	20	20	40	40	40	40			15	15	15	20
SOUTH AFRICA										15	15	20
U. S. S. R.								20	20			

WESTERN UNITED STATES TO:

ALASKA	20	20	20		40	40	40	40				15
ARGENTINA	15	20		40	40	40					15	15
AUSTRALIA		15	20	20			40	40				
CANAL ZONE			20	20	20	20	20	20				15
ENGLAND									20	20		
HAWAII	15	20	20	40	40	40	40					15
INDIA		20	20									
JAPAN	20	20	20			40	40	40			20	20
MEXICO			20	20	20	20	20	20				15
PHILIPPINES	15							40		20		
PUERTO RICO			20	20	20	20	20	20				15
SOUTH AFRICA										15	15	
U. S. S. R.									20			
EAST COAST		80	80	40	40	40	40	20	20	20		

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

G = Good, F = Fair, P = Poor.

MARCH

SUN	MON	TUE	WED	THU	FRI	SAT
					1 G	2 G
3 F	4 G	5 F	6 P	7 P	8 P	9 P
10 F	11 F-G	12 F-G	13 F-G	14 F-G	15 G	16 G
17 G-F	18 G-F	19 F	20 F	21 F	22 G	23 G
24 G-F 31 G	25 F	26 F-G	27 G	28 G	29 G	30 G

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HOT ROD ANTENNA

Achieve 1 or 2 db gain over ANY ¼ wave two meter telescopic antenna. The AEA model HR-1 Hot Rod™ antenna was designed by Dr. D.K. Reynolds (designer of the IsoPole) to deliver maximum performance for any hand-held transceiver with a BNC fitting.

The factory-tuned HR-1 is 20% shorter, lighter and places far less stress on your hand-held connector and case. It will easily handle over 25 watts of power, making it an excellent emergency base or mobile antenna. In the collapsed position, the Hot Rod antenna will perform like a helical quarter wave.

The Hot Rod antennas can be expected to make the same improvement to hand-held communications that the IsoPole brand antennas have made to base station operations. Why pay more when the best costs less?

Prices and Specifications subject to change without notice or obligation.

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↙ See List of Advertisers on page 80

With SMART PATCH You are in CONTROL

With CES 510SA Simplex Autopatch, there's no waiting for VOX circuits to drop. Simply key your transmitter to take control.

SMART PATCH is all you need to turn your base station into a personal autopatch. SMART PATCH uses the only operating system that gives the mobile complete control. Full break-in capability allows the mobile user to actually interrupt the telephone party. SMART PATCH does not interfere with the normal use of your base station. SMART PATCH works well with any FM transceiver and provides switch selectable tone or rotary dialing, toll restrict, programmable control codes, CW ID and much more.

To Take CONTROL with Smart Patch – Call 800-327-9956 Ext. 101 today.

What To Look For In A Phone Patch

The best way to decide what patch is right for you is to first decide what a patch should do. A patch should:

- Give complete control to the mobile, allowing full break in operation.
- Not interfere with the normal operation of your base station. It should not require you to connect and disconnect cables (or flip switches!) every time you wish to use your radio as a normal base station.
- Not depend on volume or squelch settings of your radio. It should work the same regardless of what you do with these controls.
- You should be able to hear your base station speaker with the patch installed. Remember, you have a base station because there are mobiles. ONE OF THEM MIGHT NEED HELP.
- The patch should have standard features at no extra cost. These should include programmable toll restrict (dip switches), tone or rotary dialing, programmable patch and activity timers, and front panel indicators of channel and patch status.

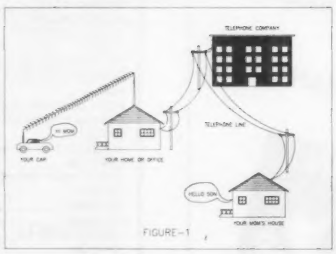
ONLY SMART PATCH HAS ALL OF THE ABOVE.

Now Mobile Operators Can Enjoy An Affordable Personal Phone Patch. . .

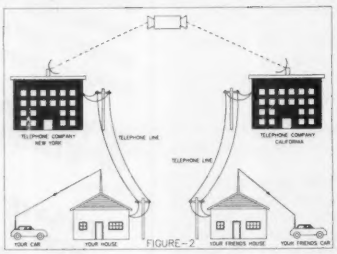
- Without an expensive repeater.
- Using any FM tranceiver as a base station.
- The secret is a SIMPLEX autopatch, The *SMART PATCH.*

SMART PATCH Is Easy To Install

To install *SMART PATCH*, connect the multicolored computer style ribbon cable to mic audio, receiver discriminator, PTT, and power. A modular phone cord is provided for connection to your phone system. Sound simple? . . . IT IS!



FIGURE–1



FIGURE–2

How To Use *SMART PATCH*

Placing a call is simple. Send your access code from your mobile (example: *73). This brings up the Patch and you will hear dial tone transmitted from your base station. Since *SMART PATCH* is checking about once per second to see if you want to dial, all you have to do is key your transmitter, then dial the phone number. You will now hear the phone ring and someone answer. Since the enhanced control system of *SMART PATCH* is constantly checking to see if you wish to talk, you need to simply key your transmitter and then talk. That's right, you simply key your transmitter to interrupt the phone line. The base station automatically stops transmitting after you key your mic. *SMART PATCH* does not require any special tone equipment to control your base station. It samples very high frequency noise present at your receivers discriminator to determine if a mobile is present. No words or syllables are ever lost.

SMART PATCH Is All You Need To Automatically Patch Your Base Station To Your Phone Line.

Use *SMART PATCH* for:

- Mobile (or remote base) to phone line via Simplex base. (see fig 1.)
- Mobile to Mobile via interconnected base stations for extended range. (see fig. 2.)
- Telephone line to mobile (or remote base).
- *SMART PATCH* uses SIMPLEX BASE STATION EQUIPMENT. Use your ordinary base station. *SMART PATCH* does this without interfering with the normal use of your radio.

WARRANTY?
YES, 180 days of warranty protection. You simply can't go wrong.
An FCC type accepted coupler is available for *SMART PATCH.*

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Presenting two small cases for a lot of mobile power.

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Nor will you find a dual-band FM mobile that offers the crossband full-duplex capability found in the 25-watt Yaesu FT-2700RH.

It shouldn't be surprising. We've been coming up with a lot of innovative concepts lately.

The FT-270RH measures just 2 x 6 x 7 inches. Conveniently fitting its high-power punch into many small spaces of your car. Places where other 45-watt mobiles just won't fit.

The FT-2700RH is small too. Smaller than other dual-banders. But with one big difference: a "DUP" button. Push it, and you're operating full duplex, 2 meters on one VFO, 440 MHz on the other. Each at 25 watts. So you can simultaneously transmit and receive in true telephone style.

Once installed, you'll find the FT-270RH and the FT-2700RH equally simple to operate. Just turn the rig on, dial up a frequency, select offset or duplex split, and you're on the air.

Each rig gives you 10 memories for storing your favorite frequencies. Dual VFO capability. A clean, uncluttered LCD display for easy readout. Push-button jumps through the band in 1 MHz steps. Band scanning with programmable upper and lower limits. And priority channel operation.

You don't even have to take your eyes off the road to determine your operating frequency and memory channel. An optional voice synthesizer announces them both at the push of a button on the microphone. The FT-2700RH announces both your 2-meter and 440 MHz operating frequencies.

Also, tone encode and encode/decode capability is programmable from the front panel, using an optional plug-in board.

So when you need a lot of power in a compact mobile radio, discover Yaesu's FT-270RH and FT-2700RH. There's nothing else like them on the road.

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Scan the World.
R-2000

Kenwood's R-2000 receiver has opened the doors to a new world in the 150-kHz to 30-MHz HF bands, with microprocessor controlled operating features and an UP conversion PLL circuit for maximum flexibility and to enhance the excitement of listening to stations from east to west, and from pole to pole. An optional VC-10 VHF converter, for 118 to 174-MHz, allows access to police, aviation, marine, commercial, and two meter Amateur frequencies. With dual digital VFO's, ten memories that store frequency, band and mode information, memory scan, programmable band scan, fluorescent tube digital display, and dual 24-hour clock with timer, this outstanding radio has the versatility needed to reach out and catch those distant and elusive stations in the most remote areas of the world.

The R-2000 receives in the USB, LSB, CW, AM, and FM modes, and its ten memories allow moving from band to band without concern for mode of operation. The programmable band scan feature permits scanning over operator selected limits, reducing scan cycle time. Memory scan allows the operator to scan all, or only specific memories. Lithium battery memory backup (Estimated 5 year life) is built-in.

With the sensitive R-2000, only the best in selectivity will do. It has three built-in IF filters, with NARROW/WIDE selector switch, and an optional 500-Hz narrow CW filter is available. A noise blanker, and an all-mode squelch circuit further enhance the operators control of his listening environment. An AGC switch, and an RF attenuator switch allow selection of the best signal-to-noise ratio. It has a large, front mounted speaker, a tone control, an "S" meter, high and low impedance antenna terminals, and operates on 100/120/220/240 VAC, or on 13.8 VDC, with an optional DCK-1 DC cable kit. Other features include a record output jack, an audible "beeper," a carrying handle, a headphone jack, and an external speaker jack.

The R-2000 places the world at your finger tips.

R-2000 optional accessories: VC-10 VHF converter • HS-4, HS-5, and HS-6 headphones • DCK-1 DC cable kit • YG-455C 500-Hz CW filter.

R-1000 High performance receiver • 200 kHz—30 MHz • digital display/clock/timer • 3 IF filters • PLL UP conversion • noise blanker • RF step attenuator • 120-240 VAC (Optional 13.8 VDC).

R-600 General coverage receiver • 150 kHz—30 MHz • digital display • 2 IF filters • PLL UP conversion • noise blanker • RF attenuator • front speaker • 100-240 VAC (Optional 13.8 VDC).

More information on these products is available from authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

Specifications and prices are subject to change without notice or obligation.